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Implementation of Operational Excellence: Challenges Related to Employee Perception and Organizational Culture

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IMPLEMENTATION OF OPERATIONAL EXCELLENCE: CHALLENGES RELATED TO EMPLOYEE PERCEPTION AND ORGANIZATIONAL CULTURE

by

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ABSTRACT

Industries that are traditionally technical and hierarchical present a variety of challenges for today's leaders, particularly given the rapidly evolving, technology-driven global business environment. In addition, the movement toward more collaborative and horizontal work environments encourages a uniquely *collective* perspective comprised of individuals who are expected to continually shift between innovation and conformance. Success in the contemporary business environment largely depends on a firm's speed and efficiency in relation to its competitors, which challenges leaders to not only remain on the cutting edge of their respective industries, but also stay "in tune" with the inner workings of their organizations in terms of culture, climate, and vision. If the pursuit and implementation of operational excellence demands a commonality or unified vision, employee *perception* is a critical component of this process.

This study focused on a single division within a global energy company that was seeking to identify and evaluate employee perceptions with respect to a corporate vision that emphasized operational excellence (OE). The study administered a survey instrument to which 204 of the division's 300 employees responded and the subsequent analysis used a series of linear regressions to measure the degree to which each demographic variable was associated with, and could ultimately predict, OE comprehension and engagement. The data showed that business unit and field of study (engineering or construction management) were both positively associated with several of the model's dependent variables; however, employment tenure, role within the company, and level of educational attainment were not statistically significant predictors. The data also showed that employees from the Public Sector (the business unit with the largest

number of employees) were less likely to perceive that current managers actively set and communicate OE expectations.

Subsequent phases of this analysis will help identify organizational structures and management styles that might contribute to (or detract from) this process. Finally, by involving key partners and potential clients in future studies to ascertain the *external* value of this vision, the organization will be able to shed valuable light on not only the culture of the firm itself, but also its market position within a highly competitive industry.

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I think that every doctoral student can easily share his/her own unique collection of anecdotal notes while navigating the proverbial journey that is the dissertation process. Although my journey perhaps involved more twists and turns (and certainly took longer) than most, this achievement is perhaps even more rewarding given the professional and personal demands that I continually faced and needed to find ways to overcome.

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"We are what we repeatedly do. Excellence, then, is not an act, but a habit."

--Aristotle

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CHAPTER 1

INTRODUCTION

There are many industries, such as construction and manufacturing which, by their very technical or hierarchical nature, face significant challenges in the integration of more humanistic models of adult development and leadership theory. As firms in these mechanistic industries depend on employee behaviors to be shaped by the directives of superiors (Taylor, 1911), this would seem to directly conflict with team role theories developed by Belbin (1993) or the evolution described by Burns and Stalker (1961) in which organizations must continually confront and adapt to unpredictability. Parington and Harris (1999) asserted individuals naturally adopt roles based on personal preferences and characteristics, which goes against the systematic processes that form the foundation of construction and manufacturing operations. Although the mechanistic nature by which these organizations are run can have a number of advantages in an operational sense, the firm's ability (or willingness) to engage concepts such as employee satisfaction, development, and motivation is often secondary. The examination of employee behavior and, more importantly, the interaction *between* employees is particularly critical to the success of an organization (Sommerville and Dalziel, 1998). Employees are trained in a manner that makes tasks as simple as possible in order to increase efficiency and, perhaps just as importantly, to facilitate entry of a replacement employee if the incumbent leaves the organization. Moreover, the hierarchical chain of command provides a clear authoritative structure and means of communication. However, this method of operating has a number of disadvantages. The most notable is that mechanistic organizations are slow to adapt to environmental changes, which are increasingly fast-paced and global in nature (Merton, 1957). In addition, these types of

organizations can have a dehumanizing effect that, instead of directing employee behavior toward the good of the organization, leads to resistance to change and insubordination (McGregor, 1957).

Competitive, performance-based Darwinian environments characterize traditional, hierarchical organizations. The primary role of the leader is to "develop" followers not in the transformational sense described by Burns (1978) and Bass (1985) among others, but rather as a transactional, bottom line-oriented exchange, that perpetuates a non-humanistic organizational culture. The objective of the leader is to identify and utilize the skill set of each follower in a way that ensures the greatest financial success for the firm. The development of the individual herself is clearly secondary, and thus the methods by which this same individual then "leads" others creates a vicious cycle that is not easily altered. The presence of a deep-rooted, traditional culture often constitutes the very essence of the organization, both within the workplace and in the external environment.

Although the study of organizational culture and climate provides a useful examination of the firm's espoused values and beliefs as well as the perceptions that may currently exist within the workforce, it does not adequately capture the specific challenges and responsibilities with which leaders are faced. As individuals often charged with setting the course, serving as role models, providing guidance and support, and establishing the strategic direction of the organization, the leader's responsibilities can be vast and overwhelming. According to Scharmer (2007), the most important of all leadership challenges is to provide *generative* responses to address *systemic root issues* rather than settling for *reactive* responses on a *systems* level. The challenge implies a

level of adult development that seeks transcendence and a *willful* form of leadership consciousness that pursues universal meaning and understanding. The leadership role within the workplace both obligates and challenges the leader to assume the responsibility of charting this course within the organization.

The construction industry in particular is unique because of its "geographically distributed nature" (Riley and Clare-Brown, 2001, p. 150). A typical construction firm will have distinct organizational cultures on each individual project, in addition to having "a highly mobile and itinerant work force" (p. 150) and a large number and variety of "partner" companies that must interact and collaborate under stressful conditions. The idea that a construction company can have multiple organizational cultures (within the main office, "in the field," on individual projects, union vs. non-union, hourly vs. salary, etc.), and a variety of subcultures within each, challenges the firm to "rely on a larger and deeper company hierarchy to reinforce company culture, corporate memory, and management" (p. 157).

If motivation is an "assumed force" that exists within the individual, causing them to choose one option over another, culture is a "collective programming" that influences individual behaviors (Hofstede, 2005, p. 4). Hofstede distinguishes culture from human nature and individual personality since culture is both learned and shared (Hofstede). Among the various motivation theories from the past several decades, Herzberg's theory of motivation versus hygiene is particularly applicable to organizations. Herzberg posited that organizations are comprised of elements with both positive and negative motivation potential. The elements of positive motivation potential are the "real" or "intrinsic" motivators that include the work, achievement, recognition, responsibility, and

opportunities for advancement. Herzberg defined the "extrinsic" elements as company policy and administration, supervision, salary, and workplace conditions (p. 264). Thus, Herzberg argued that individuals are ultimately motivated by the "content" rather than the "context" of their work (p. 265). However, even Maslow's hierarchy of human needs (1943) will vary depending on the cultural characteristics of the individual in question.

Since the notion of collective programming is particularly relevant for traditionally hierarchical firms in which established procedures and clear lines of authority exist, "culture embedding" (Antonakis, Cianciolo, and Sternberg, p. 275) may not be as static as it once appeared to be. Although a leader may influence a firm's *initial* culture, its development ultimately evolves from the collective social interactions of employees and the environments with which they continually interact. As new trends and methodologies appear within these environments, an organization is faced with the challenge of adapting to this environment while also maintaining control of (or congruence with) its established organizational culture. The construction industry (particularly given the need to remain innovative and technology-driven) offers a timely and pertinent case study of the challenges that hierarchical firms face as they frequently encounter paradigm shifts within their own industry. In light of the difficulty in introducing and implementing *any* process or procedure within the subject company, how challenging would it be to introduce a cultural and philosophical initiative such as "operational excellence" across a diverse, multi-site division with over 300 employees?

Problem Statement

The implementation of operational excellence (OE) across a global energy corporation is a complex undertaking, given the tens of thousands of employees working in various nations across a variety of disciplines. Since each of these individuals will

"receive" the OE message in a unique and distinct way, it is of interest to the firm to determine what types of employees will be more or less likely to "buy in" to this corporate-wide initiative. Constructs such as employee comprehension, engagement, and leadership effectiveness can be used to further understand if and how employees are receiving the message, the degree to which employees are actively involved in OE-type activities, and the extent to which employees are exposed to OE behaviors from his/her peers or supervisors.

If the data indicates that variation among employees exists with respect to the comprehension of and participation in OE activities and behaviors, the next step would be to determine the factors that explain this variation. Are there different leadership types and structures across different geographic locations that might contribute to this variation? Are there demographic measures (e.g. longevity with the company, educational background, or workplace organizational structure) that might indicate a particular embracement or rejection of fundamental OE principles? The value of the information lies not only in the internal culture that the firm seeks to establish and inculcate across all divisions, but also the implementation of an organizational alignment that promotes collaboration and ensures competitiveness in the marketplace.

Clearly, context is also an important factor to consider. An employee's ability and/or willingness to adopt the OE framework could be adversely impacted by the environment and organizational climate in which the individual currently exists. Financial struggles, recent layoffs, and toxic leadership are only a few of the variables that can certainly influence the extent to which an employee can or will embrace an organizational initiative. Kegan and Laskow's concept of "competing commitment" is

particularly applicable here, given that managers need to probe deeper into the psychological dynamic that prevents individuals from adopting change (Kegan and Laskow, 2001). In addition, a leader needs to "differentiate among the various types of resistance – blind, ideological and political – so that the appropriate responses to and interactions with people in the organization can take place" (Burke, 2013, p. 260). If an employee is not behaving in a manner consistent with OE principles, the reasons (and source) of this behavior is an extremely important and valuable part of the analysis.

Purpose of Study

The primary purpose of the study was to determine whether fundamental and addressable "disconnects" exist between the OE message that the firm is seeking to implement across all divisions and the individual and collective interpretations that exist within the subject division. Are there specific types of individuals or even perhaps groups of individuals who demonstrate a clear tendency to either embrace or reject OE principles? If employee engagement increases when "team values" are present and shared, the existence of a company culture that is committed to the *practice* of OE principles would be particularly important (Schreurs, Hetty van Emmerik, Van den Broeck & Guenter, 2014).

If individual perspectives can be determined and then categorized, the company might then be able to structure interventions such as workshops or continuous education seminars that are customized in accordance with the identified viewpoints of these employees. Ultimately, the corporation is committed to being continually proactive about identifying and understanding where its employees sit on the spectrum of compliance with and adoption of its corporate initiatives. In addition to serving as a guide to understanding variations among the current workforce with respect to OE

principles, the data gathered from this study can also provide strategic guidance in terms of ideal new hires, promotions for existing employees, and potentially the re-structuring of the organization to more effectively address and execute on this commitment.

Research Questions

The following questions guided this study:

1. What is the current level of organizational effectiveness in the implementation of operational excellence in terms of employee comprehension, engagement, and leadership awareness within the division?
2. To what extent can the variation in the level of organizational effectiveness in the implementation of operational excellence within the division (in terms of employee comprehension, engagement, and leadership awareness) be explained by select demographic (independent) variables?

CHAPTER 2

REVIEW OF THE LITERATURE

Operational excellence can be viewed not only in terms of process management and continuous improvement, but also as stemming from a strategic vision within an organization. The subject organization for this study defines such a vision as a continuous and deliberate process that ultimately becomes a *cultural* shift. This vision, which includes safety, personal health, environment, reliability, and efficiency, encourages strong leadership and company-wide engagement that requires openness, trust, and collaboration to be successful. The fulfillment of this vision entails a process of change management that involves an evolution of values, culture, and commitment among the members of the organization.

This literature review section includes first a discussion on the concept of change management in terms of culture and leadership, which is followed by a review of the collaborative business processes to achieve operational excellence, specifically as related to hierarchical organizations. A discussion on organizational culture and climate follows, particularly with respect to the *internalization* of these concepts by employees that significantly influences engagement and satisfaction within the workplace. Finally, there is a focus on the ethical work climate and the role that leadership play— not only in establishing such a climate but also in modeling behaviors that reinforce the vision across workplaces that are constantly evolving and becoming increasingly diverse. Operational excellence, then, is a strategic objective that is not only highly complex but also requires alignment across a changing organizational landscape.

Change Management

A frequent and fundamental concept in discussions on organizational change is that change is only necessary because of individual failures (Weick and Quinn, 1999). Scholars such as Robertson and Seneviratne (1995) and Yukl (2010) discussed the nuances of planned organizational change, the different types of such changes, the leader's role in implementing change, and the reasons why individuals resist organizational changes. Armenakis and Bedeian (1999) posited that "the successfulness of change efforts is due to not only their content or substantive nature, but also the processes followed or actions undertaken during their implementation" (p. 308). In addition to providing a clear articulation of the reasons for change and an explanation of the methods by which change will be accomplished, organizational leaders are tasked with determining whether a cultural change is also in order. As Schein (2004) stated, "Culture change inevitably involves unlearning as well as relearning and is therefore, by definition, transformative" (p. 335).

Van de Ven and Sun (2011) posited that planned changes break down "because participants do not recognize the need for change, they make erroneous decisions, or they do not reach agreement on goals or actions" (p. 61). These proposed changes can also break down due to a lack of consensus on objectives or goals, the existence of "cognitive biases" that impair critical reasoning, or the "self-justification" phenomenon in which initial decision-makers tend to commit more strongly than others to a failing course of action (p. 62). Van de Ven and Sun argued that a "contingency theory of implementation" is best suited for change management in that it enables the firm to be flexible and ready to adapt to changing conditions and situations.

Antonakis, Cianciolo and Sternberg (2004) and Trice and Beyer (1993) argued that the leader's role is critical to not only communicating the company's vision and building consensus, but also to changing the organizational culture as needed to implement the vision. Trice and Beyer posited that culture change refers to "planned, more encompassing, and more substantial kinds of changes than those which arise spontaneously within cultures or as a part of conscious efforts to keep an existing culture vital" (p. 393). The implementation of the operational excellence vision requires such a culture change, given the employee commitment and values-based alignment on which such a vision depends.

In Search of Operational Excellence

Among several challenges and expectations, executive management within a corporation is typically tasked with performing systems analysis for the execution of strategic goals. Scholars have conducted a variety of studies that have determined that organizations that "embrace operational practices that focus on right first time, high efficiency (productive) and effectiveness (customer/market oriented)" achieve operational excellence (Lu, Betts & Croom, 2011, p. 1268). However, this global concept is a bit more complex in that it needs to be customizable and applicable to any type of firm or business, must be able to withstand and adapt to changing environmental conditions over time, and "must have *balanced* measures in terms of covering the different aspects of business at a high level so that it helps to deliver a comprehensive world-class evaluation" (p. 1268).

The rise of business excellence models (BEM) and frameworks such as Total Quality Management (TQM), European Foundation of Quality Management (EFQM), the Criteria for Performance Excellence (CPE) and the US Malcolm Baldrige National

Quality Award (MBNQA) is mainly attributed to a heightened focus on meeting organizational objectives in the most effective and efficient manner possible (Corbett & Angell, 2011). The seven requirements of CPE include leadership, strategic planning, customer focus, measurement, analysis and knowledge management, workforce focus, process management and results (p. 757). Although the implementation of these frameworks has been shown to have positive financial and non-financial outcomes (Dahlgaard, Chen, Jang, Banegas & Dahlgaard-Park, 2013), a wide range of barriers remain. These include lack of top management commitment, resource limitations, fear of change, work overload, lack of comprehensive quality improvement education, and lack of staff involvement (Dahlgaard, et al.). Sustainable business excellence depends on "continuous adaptation" (Metaxas & Koulouriotis, 2014, p. 495) to changes in the organization's external environment.

Executive management is also expected to create and define the organizational structure as well as identify key business processes. The establishment of a "process map" serves to identify "the inputs and outputs of a process, its customers and suppliers, and the key measures that characterize its performance" (Burton & Pennotti, 2003). Although lower levels of the organization execute process management, executive leaders are tasked with *integrating the system of processes* that ultimately enables a company to compete and succeed in the marketplace. This integration depends on the establishment of an organizational culture that aligns the company's employees in terms of values, beliefs, and goals.

In the Competing Values Framework (CVF) developed by Cameron and Quinn (2005), the authors structured the framework as a quadrant with an upper level that

emphasized flexibility and transformational change while the lower level was characterized by transactional objectives and control. A central concept of the CVF research is that effective managers are those who are able to assume and implement a variety of roles in order to properly communicate the appropriate message at the right time to the correct audience (Belsen and Frank, 2010). Cameron and Quinn (2005) also posit that as organizations move into different quadrants the culture within the organization needs to change in order to function in that new quadrant. Rogers and Hildebrandt (1993) focused more specifically on the concept of "message orientations" in a quadrant framework similar to the CVF, suggesting that "each quadrant in the CVF represents a different message orientation with significant parallels and polar opposites: relational, hierarchical, promotional, and transformational" (p. 283). This is a particularly challenging undertaking in traditional and slow-moving organizations that are fundamentally vertical in nature.

Philosophical Paradigm Shifts in Construction

The quest for operational excellence in hierarchical industries such as construction has manifested itself in the movement toward aligned and collaborative work structures. An example of this is the prevalence of lean construction, which refers to a product management approach that seeks to change the project delivery process. The emphasis is placed on maximizing efficiency and flow while minimizing waste. Lean construction seeks to improve the whole system by optimizing the design and construction processes rather than focusing on individual activities. A critical component is also the open sharing of information between the owner, designer, and contractor in order to identify the most effective means by which to carry out the expectations of the owner. While ensuring adherence to budget and schedule, the team also uses both "pull"

and “push” techniques to identify and execute critical tasks and milestones (Furst, 2010). Pulling is a technique used to ensure “just-in-time” coordination between upstream and downstream tasks. In other words, the upstream task does not engage until it is required by the downstream task. In construction, this means supplying materials, labor, and equipment only on an “as-needed” basis (Mao and Zhang, 2008).

Integrated project delivery (IPD) is a more formalized construction philosophy that centers on stakeholder alignment and the utilization of technology to maximize efficiency and value to the project owner. A fundamental component of the IPD process is the establishment of “common memory” and “common reasoning” within the strategic team (Sun, p. 71). Once the general contractor and key project team members are selected, these individuals need to develop an understanding of design parameters, methodologies, and costs as part of the process mapping procedure. Although the IPD concept appears to be a viable method by which to increase construction efficiency, challenges still exist. From a legal perspective, contracts based on the IPD framework are still in the development phase and have not been proven over time. In addition, the insurance industry has not yet been able to provide a comprehensive coverage instrument for this model. Finally (and perhaps most importantly), there is an *organizational culture challenge* since construction firms are “accustomed to traditional way of leadership, responsibility, and opportunity, and change is slow” (Kent and Becerik-Gerber, p. 816).

The increasing complexity of construction projects has diminished the role of the “master builder” and has instead resulted in a greater need for contractor specialization. In addition to creating multiple subcultures, this development has challenged the industry to combat inefficiency and reduce fragmentation (Kent and Becerik-Gerber, 2010). In

addition, the complexity of these projects is further increased by the existence of "ambiguous jurisdictions", which are failures to define roles or boundaries of responsibility (Pretorius and Taylor, 1986, p. 95). The prevalence of fragmentation and ambiguity within the industry extends to individual construction firms, which are also characterized by individuals with competing (if not conflicting) beliefs, objectives, motivations, and values. It is a leader's responsibility, therefore, to develop a healthy culture through "the exemplification of trustworthiness and trust, empowerment and delegation, consistency and mentorship" (Kane-Urrabazo, 2006, p. 189). The establishment of an organizational culture and climate is viewed as a means to not only reduce waste and increase efficiency, but also ensure alignment toward organizational goals and a common identity.

Organizational Culture and Climate

The culture and climate of the given organization refer to normative, collective structures that shape the behaviors of the individual members (Treviño, 1986). Schein (2004) defined organizational culture as "a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration" (p. 17). The culture of the organization can influence behavior and play a part in the moral development of individuals through the assignment of roles and decision-making responsibilities (Treviño, 1986). Hofstede (1994) posited, "Values represent the deepest level of a culture" (p. 12) and, although individuals may enter a work environment with many of their values firmly established, they can become socialized to the practices and customs of the new environment. According to Deal and Kennedy (2000), "a strong culture is a system of informal rules that spells out how people

are to behave most of the time. In a weak culture, employees waste a good deal of time just trying to figure out what they should do and how they should do it" (p. 15).

While workplace culture can be described as *the way we do things around here*, the work climate refers to *the way things are around here* (Vardi, 2001). Workplace climate involves shared perceptions of the organization, while the culture refers to organizational *assumptions* (Agarwal and Cruise, 1999). Schneider (1975) defined work climates as "psychologically meaningful moral perceptions that people can agree to characterize a system's practices and procedures" (p. 474). His seminal work climate theory asserted that individuals seek to achieve a sense of order in their respective environments and adapt their behaviors accordingly. Thus, individuals exhibit certain behaviors in response to a *perceived* environment of accepted practices and procedures. They seek "congruity between behavior and the system's practices and procedures" (p. 474). Similarly, Hellriegel and Slocum (1974) found that individuals tend to not only accept but also *internalize* the climate of the organization, and this has a significant effect on their behavior. According to Denison (1996), both culture and climate in organizations "entertain the possibility of a shared, holistic, collectively defined social context that emerges over time as organizations struggle with the joint problems of adaptation, individual meaning, and social integration" (p. 625). Culture is thus not only a socially-derived construct, but one that is ultimately internalized and guides individual behavior.

Shared Values through an Ethical Work Climate

Organizations can have several different types of climates within the workplace, for example, related to safety, creativity or product quality. The work climate can also vary widely within different sectors and levels of the organization since various ethical

climate dimensions can exist (Wimbush, Shepard & Markham, 1997). The ethical work climate differs from other types of work climates in that it refers to "organizational practices with moral consequences" (Cullen, Parboteeah & Victor, 2003, p. 128). In other words, ethical work climates determine employees' perceptions of how the organization will respond to ethical dilemmas or challenges (Appelbaum, Deguire & Lay, 2005a). The ethical climate also assists employees with identifying ethical issues within the organization, thus providing them with a "perceptual lens" (Cullen, et al., p. 129) through which to assess and determine appropriate resolutions for situations of a moral nature (Barnett and Vaicys, 2000). Although organizations can communicate formal and explicit ethical policies and procedures, workers will ultimately behave in accordance with the *perceived* ethical work climate (Agarwal and Malloy, 1999).

Gouldner's (1957) sociological theories of reference groups posit that individuals look outside themselves for norms of behavior and definition of roles. Cohen (1995) posited that "with the workplace replacing the church and state as a primary source of behavioral norms and even moral values, ideologies reinforced in the work setting have a stronger impact on behavior outside the workplace than at any other time in history" (p. 338). The degree to which workers *share* the ethical values of the organization is crucial since the ethical climate of an organization may be linked not only to ethical behavior within the workplace but also to counterproductive work activity (Peterson, 2002). Kohlberg (1984) argued that individuals in a particular stage of moral development can function in groups that have an ethically incongruent work climate, but they may experience stress and/or engage in whistle blowing (Victor and Cullen, 1988). An organizational culture that shares similar ethical values of the workers and encourages

individuals to engage in moral conflict resolutions may enhance the cognitive moral development of the individual (Trevino, 1986). If operational excellence is not only an integration of processes but also a manifestation of a confluence of aligned values, the commonalities between an ethical climate and operational excellence are clear.

Employee Engagement and Satisfaction

Self-determination theory holds that a company that emphasizes the development of intrinsic values will lead to better work-related outcomes than one that promotes extrinsic values. The encouragement of intrinsic values facilitates "need satisfaction" for employees, which leads to work engagement and enhanced performance (Schreurs, et al., 2014). Trust between the leader and employee is also critical, given that "leaders' openness and consistency between beliefs and actions play an important role in influencing employees' decisions to provide voluntarily comments or suggestions intended to spark organizational improvement, which in turn help them to learn and to be engaged at work" (Wang and Hsieh, 2013, p. 615). Thus, employees who trust management and believe that the company is committed to practicing espoused values and beliefs will foster the development of employees who are more committed, engaged, and productive. This type of *inclusive leadership* induces the type of reciprocity on which social exchange theory is based (Bong C., Bich H.T. & Il P., 2015) and is ultimately the type of exchange on which the implementation of a sustained and values-driven concept such as OE depends.

Kim and Mondello (2014) describe the importance of building a "constructive organizational culture" (COC) given that such a culture can positively influence a firm's direction, growth and innovation as well as employee commitment and satisfaction. Aarons and Sawitzky (2006) posit that constructive cultures are "characterized by

organizational norms of achievement and motivation, individualism and self-actualization, and being humanistic and supportive. Constructive cultures encourage interactions with people and approach to tasks that will enable staff to meet their higher order satisfaction needs" (p. 292). Some scholars have argued that since significant correlations exist between employee satisfaction and organizational climate, satisfaction may indeed be an *outcome* and it exists in varying degrees under different types of climate (Hellriegel & Slocum, 1984). Thus, the challenge of aligning these various outcomes with the overall goals of the organization is daunting and complex.

The notion of *value congruence* refers to a "fit" between the moral development of the individual and the ethical climate of the organization (Ambrose, Arnaud & Schminke, 2007). Empirical studies have suggested that the degree to which the ethical values of the individual and the organization match can affect job satisfaction, organizational commitment and employee retention. Emphasis on person-organization fit could also reduce the likelihood of potentially harmful unethical behavior (Vardi, 2001). In addition, ethical work climates that are perceived by employees to be egoistic may result in the promotion of self-interested behavior and the lack of teamwork. Similarly, climates perceived to be benevolent and caring strongly correlated to greater attachment to the organization and to organizational commitment (Cullen, et al., 2003).

Scholars have emphasized the importance of understanding the *relationships* between an organization's ethical climate and the attitudes and behaviors of employees (Elçi and Alpkan, 2008). They found employee job satisfaction to be directly related to perceptions of the ethical quality of the work climate. Victor and Cullen developed an ethical climate questionnaire (ECQ) that was designed to measure employee perceptions

with respect to ethics in their organizations. Their study found that ethical climates within organizations could vary according to employee position, tenure, and membership within a specific workgroup (Victor and Cullen, 1988). Using a modified form of the ECQ, Elçi and Alpkan found a strong negative correlation between a self-interested ethical work climate and work satisfaction. The authors' regression model was statistically significant (F = 34.350; R = .227; P = .000) and indicated a Beta value of -.092 with respect to their hypothesis that a self-interest climate will have a negative effect on work satisfaction (Elçi and Alpkan, 2008). The authors also found that benevolent climates and ethical climates that emphasized a collaborative and team-oriented approach were associated with job satisfaction and organizational commitment. The authors noted that organizations "can exhibit various types of ethical climates at different levels of intensity" (p. 307). Since climates based on factors such as company profit, efficiency and personal morality were found to be unrelated to work satisfaction, the authors argued that every organization should have a law and professional codes ethical climate, which was the only dimension in this study to be *positively* associated with work satisfaction.

In addition to ensuring work satisfaction among the workforce, the establishment of an ethical work climate can help an organization to prevent unethical behavior. Using the ECQ and a confirmatory factor analysis (CFA), Peterson (2002) measured production, political and property deviance as well as personal aggression. Peterson concluded that unethical behavior is less likely to occur in organizations that have a high value for "Employee Focus" (a high concern for employees), stress individual ethics, and emphasize strict adherence to company rules. In addition, Cullen, et al. (2003) found that work satisfaction and organizational commitment are more likely to occur when

employees perceive an environment of common perspectives that ultimately have a strong effect on their commitment to the organization.

Vardi (2001) conducted an empirical study that suggested that employees tend to adopt and even internalize the climate of the organization in which they work; thus, a *positive* work climate leads directly to work satisfaction. Positive work climates often depend on the degree to which the organization provides comfort and support as well as the extent to which the organization's reward system is considered by workers to be equitable. Ethical climates can also be reinforced through the development of mission statements that are employee-focused and emphasize concern for employees as well as the establishment of cultural processes that call attention to ethical behavior (Peterson, 2002).

Research has shown that reward systems can provide an effective means by which to reinforce the ethical values and guidelines of the organization (Logsdon and Yuthas, 1997). An organization that rewards its employees for engaging in behavior that is consistent with the organization's expectations (and punishes those who do not) effectively communicates to the workplace the importance of adhering to the organization's espoused moral climate. However, scholars have found that a link exists between unethical behavior and organizational rewards systems that are *outcome-based* rather than *behavior-based* (Appelbaum, Deguire & Lay, 2005b). An outcome-based reward system encourages individuals to operate at the lower stages of moral development since they behave ethically only if a reward or punishment will result (Baucus and Beck-Dudley, 2005). In contrast, a behavior-based reward system focuses on the *qualitative results* of the employee's performance. This type of system is

characterized by managerial direction, monitoring and intervention of activities and results, and includes evaluations of individual qualities and aptitudes (Appelbaum, et al., 2005b). Oliver and Anderson (1994) conducted a qualitative, survey-based study that indicated a link between behavior-control systems and increased ethical behavior, job satisfaction and organizational commitment.

The organizational moral development model (Logsdon and Yuthas, 1997) can be used by top management to identify the gap that might exist between the current level of the organization and the level where top management would like it to be. If the leadership of the organization does not clearly exhibit or communicate ethical or unethical behavior, subordinates may assume organizational amorality or ethical neutrality (Treviño, Hartman & Brown, 2000). If the goals, values and purposes of the organization are not clear, subcultures can emerge that effectively establish their own value systems (Schein, 1984). Rather than simply eliminating these subcultures, an ethical leader can instead seek to understand and embrace the differences between these subcultures, emphasizing instead the common goals of the organization (Appelbaum, et al, 2005a). An ethical leader is one who establishes a framework for dealing with ethical issues, and this framework contributes to the formation of the organization's ethical climate (Schminke, Ambrose & Neubaum, 2005).

Ethical Leadership

Bass (1985) identified four dimensions of transformational leadership: idealized influence, inspirational motivation, intellectual stimulation, and individual consideration. Transformational leaders inspire subordinates to share the values of both the leader and of the collective group. The leader's behavior communicates directly to subordinates the

values and ethical expectations of the organization. Research has shown that values-based leadership training can assist managers to communicate to subordinates the organizational ethical vision (Grojean, Resick, Dickson & Smith, 2004). Grojean and colleagues posited that leaders could influence their organization's ethical climate through seven mechanisms: use values-based leadership; set the example; establish clear expectations of ethical conduct; provide feedback, coaching, and support regarding ethical behavior; recognize and reward behaviors that support organizational values; be aware of individual differences among subordinates; and establish leader training and mentoring.

Although production and profitability are often identified as the primary objectives of the leader of a business organization, many scholars have argued that the leader's responsibility to ensure moral and ethical conduct is equally important. The adoption of shared values such as integrity and honesty in business relationships actually expands contracting and transacting opportunities due to "reduced opportunism" (Jones, 1995, p. 417). Frank (1988) argued that unethical behavior and self-interest are effectively incompatible with productive and mutually-beneficial business relationships. Others have asserted that the ethical approach of the leader has a significant impact on the ethical climate of the organization through role modeling, forms of communication and rewards systems (Schminke, et al., 2005). The leader's *reputation* for ethical leadership is also crucial, given the distance that often exists between the leader and the majority of employees (Treviño, et al., 2000). Treviño and colleagues found that ethical leaders exhibit values-based leadership and concern for others, establish a system of rewards and punishments, and communicate the importance of ethical standards and

principles to others. A leader with a reputation for ethical leadership is one who is perceived by subordinates to be both a moral person *and* a moral manager. Traits such as honesty and trustworthiness describe the moral person while holding followers accountable for ethical behavior describes the *moral manager* (Treviño, 1986).

One of the most effective ways in which the leader can transmit the importance of ethical behavior within the workplace is through ethical role modeling (Brown and Treviño, 2006). Leaders are a primary source of this type of role modeling given their hierarchical position and their authority to affect the behavior and status of subordinates (Brown, Treviño & Harrison, 2005). In empirical studies, employees have identified characteristics such as caring, honesty and fairness as associated with ethical leadership (Weaver, Treviño & Agle, 2005). In addition, leaders who seek to align the needs and values of individuals with those of the organization's culture are most likely to enhance motivation and productivity (Burke, 2013). Followers have also identified principled decision-making, the communication of ethical expectations, and holding individuals accountable as factors that influence perceptions of ethical leadership (Brown, et al., 2005). Mendonca (2001) states, "leaders are responsible for the organization's moral climate that, in effect, reflects the moral development of the leader…" (p. 268). The flow of discipline, process, and structure begins with the leader and moves to the functional units, ideally in a *continuous exchange* of feedback and learning.

The performance and success of a company is a multi-faceted concept that includes financial outcomes (e.g. profit), market-based outcomes (e.g. market share), and effectiveness indicators (e.g. measures of output/resources) (Tuominen, Rajala & Moller, 2000). However, the degree to which overall operational excellence (effectiveness and

efficiency) is achieved depends upon the timely and successful comprehension and implementation of the fundamental constructs (both intrinsic and extrinsic) that drive this excellence. An additional complexity stems from the diverse and ever-changing workforce itself, which is comprised of individuals with a wide variety of expectations, needs, and motivations.

As organizations operate in several different countries or, perhaps more commonly, employ individuals from a variety of different backgrounds, leaders can benefit from having a more comprehensive knowledge base that incorporates differences both across and within cultures. By expanding their research on cross-cultural differences, researchers can analyze the effects of situational variables that are not normally included in current leadership theories, such as religion, language, history, and politics (Yukl, p. 437). If a leader's primary objective is to influence her followers, she should seek to understand how the individual's cultural background can influence his/her perception of the leader.

A Cross-Cultural Focus

According to Resick, Hanges, Dickson & Mitchelson (2006), "The increasingly multinational nature of business creates a need for research aimed at understanding global business ethics, and this is particularly true regarding ethical leadership" (p. 346). Many empirical studies of ethical work climate have lacked the inclusion of cross-cultural or global perspectives. Scholars such as Hofstede (2001) and the authors of the GLOBE project (Javidan, Dorfman, Sully de Luque & House, 2006) conducted qualitative, interview-based studies to identify cultural dimensions across nations. Hofstede's analysis of the data provided by a survey of IBM subsidiaries resulted in the development

of a theory of four (and later, five) cultural dimensions that could be used to categorize and compare individuals from various cultures: individualism-collectivism, masculinity-femininity, uncertainty avoidance, power distance and long-term vs. short-term orientation. Hofstede used the data from the surveys to "score" each individual country in terms of "low," "medium" or "high" in each respective category.

Project GLOBE's "culturally endorsed implicit leadership theory" (CLT) argued that leadership belief systems are shared among individuals from the same culture (Javidan, et al., 2006). Although the researchers initially reviewed twenty-three leadership styles, the project focused on six global leader behavior dimensions: (1) transformational-charismatic, (2) team-oriented, (3) self-protective, (4) participative, (5) humane, and (6) autonomous (House, Javidan, Hanges & Dorfman, 2002). The project also identified twenty-two attributes (e.g. honest, decisive, dynamic) considered to be universally desirable, and eight (e.g. loner, irritable, egocentric) viewed as universally undesirable (Javidan, et al.). Expanding upon the cultural dimensions first proposed by Hofstede, the GLOBE Project proposed six initial dimensions (uncertainty avoidance, power distance, social collectivism, in-group collectivism, gender egalitarianism and assertiveness) and added future orientation, performance orientation and humane orientation (House, et al., 2002).

Resick, et al. (2006) specifically focused on the degree to which four aspects of ethical leadership (character/integrity, altruism, collective motivation and encouragement) were endorsed across cultures. Although the authors found all four aspects of ethical leadership to be universally supported, the degree of endorsement varied across cultures (Brown and Treviño, 2006). The studies of Hofstede (2001), the

GLOBE project and Resick, et al. (2006) are further limited by the cultural heterogeneity of their sampling within countries, as well as the argument that a culture can essentially be molded over time, evolving as a result of certain circumstances or developments (Antonakis, Cianciolo & Sternberg, 2004). The inclusion of cultural heterogeneity is crucial to a complete understanding of a given national culture in that individuals from different regions of a single country can vary widely in terms of their values, behaviors, and views on ethical leadership. Cultural heterogeneity, however, exists even *within* organizations and the extent to which incongruence occurs between individuals, departments, divisions, or even subcultures is a particularly crucial organizational dynamic.

In many respects, the various stages and team members that comprise a typical construction project present another form of a "cross-cultural" challenge. As various firms (each with distinct organizational cultures) participate in a project at different stages, the challenge of the leadership team is to assimilate these events in a manner that is conducive to the overall success of the project. In addition to developing "buy-in" and building consensus, each participating firm is also challenged to preserve its own organizational culture or, at the very least, maintain *internal* value congruence even as it participates in a new project or adopts a new technology, system, or methodology (such as operational excellence).

As previously noted, various studies (Ambrose, et al., 2007, Appelbaum, et al., 2005a, Appelbaum, et al. 2005b, Barnett and Vaicys, 2000, Bong, et al., 2015, Cullen, et al., 2003, Schminke, et al, 2005, Schreurs, et al., 2014, Treviño, et al., 1998) have demonstrated that employee satisfaction and engagement generally increase when

employees feel aligned with the ethical climate of their respective organizations. In addition, employees are more likely to engage in the achievement of the organization's strategic goals when they not only understand the objectives but also *believe in* these goals. This is particularly important given paradigm shifts in industries such as construction that now focus on a more collaborative project delivery approach. Given the importance of ensuring comprehension and alignment among the workforce, how can it be determined whether employees receive the message or whether the organization needs to send the message differently? A survey instrument can be implemented as a first step to identify any potential areas of interest. If it is found that comprehension and engagement vary across the workforce, a valuable next step would be to determine not only how these concepts differ across the organization but also the reasons behind these differences.

CHAPTER 3

METHODOLOGY

This study used quantitative methods in order to test whether nine demographic variables had non-zero effects (at the $p \leq .05$ level) on the dependent variables themselves as well as when they were used together in three separate constructs, and whether these demographic variables can serve as statistically significant predictors of the assorted dependent variables. This chapter includes a discussion of the methods used to collect and analyze data, as well as information with respect to the survey method, software, strengths and weaknesses of the research design, and significance and limitations of the study.

Site and Participant Selection

The research design of this study was exclusively quantitative given that it involved data analysis of a survey instrument administered to all employees of an organization. The study was conducted under the umbrella of the Human Resources and Operational Excellence departments, both of which were (and are) highly interested in identifying ways in which the company can be more efficient and effective with the allocation of resources toward continuous education and training, primarily in relation to the corporate-wide operational excellence initiative.

The corporate and division HR and OE managers were all experienced industry professionals with several years of employment in their respective disciplines. Since no existing survey instruments that focused specifically on OE in a service industry were found, a new instrument was developed specifically for this study. As subject matter experts, the HR and OE managers were active participants in many aspects of the survey development such as selection of demographics, wording and sequence of questions, and

communication with employees. The OE manager took the lead in sending an email to all employees with an introduction to the study and a discussion on the importance of employee participation (Appendix C). The OE manager also emphasized that the survey was completely anonymous and the data used exclusively as a tool through which both HR and OE personnel could evaluate and assess the effectiveness of current OE messages and programs. The OE manager provided each employee with a Consent Form (Appendix D) that served as an introduction to the survey. The OE manager also sent weekly reminders to all employees to respond to the survey, again emphasizing the importance of honest feedback as part of the implementation of OE in this division.

The study invited all current employees of the subject division within a large global energy corporation, which included more than 300 individuals across four regional office locations. The demographics portion of the instrument (Appendix A) requested information such as role within the company, current business unit, geographical location, primary work environment, number of years with the company, highest level of educational attainment, field of study (engineering/construction management vs. other/none), current organizational structure, and exposure to and/or participation in OE activities. These items served as the independent variables throughout the analysis.

In order to ensure comprehension of the survey instrument and to identify any potential sensitivities with respect to the survey questions, the OE and HR management teams conducted three pilot tests that involved a small cross-section (eight random individuals) of the employees of the division. The initial pilot study identified a few wording issues on the survey questions that caused confusion for the employees. These were subsequently modified and then re-distributed in a second pilot test to eight

different employees, where one remaining wording issue was uncovered. A final pilot test was then administered to another eight employees, and these individuals did not identify any issues with the updated survey. The final survey questions can be found in Appendix B.

Since the population of the subject division was approximately 300, the desired confidence interval 95%, and the margin of error estimated at 5%, this study required 169 respondents in order to have a power calculation of at least 80%. Due to the importance of this study for the company as well as the close involvement of both the HR and OE management teams, the final number of respondents was 204. Table 1 shows the number of responses per survey question. For each of these questions, respondents were asked to choose among five responses: 1=strongly agree, 2=slightly agree, 3=neither agree nor disagree, 4=slightly disagree, and 5=strongly disagree. Half of the questions are positively slanted and half negatively slanted in order to minimize the tendency for respondents to respond in a similar manner (i.e. all positive or all negative) across all 30 questions.

I chose to study these individuals because they are an interesting, diverse, relatively small, and very accessible group of individuals that comprise a division within a global energy firm. The company requires every employee to complete basic OE training immediately upon being hired and then additional training on an annual basis. This training is typically administered through a series of timed, online modules that each employee is required to complete. As a result, all 300 employees within the division have an understanding of what OE is and its importance within the organization. Since the study was endorsed and administered by the company (under the auspices of the HR

and OE departments), the response rate was in line with initial expectations. The survey was distributed to all employees via email with a link to complete the survey online through SurveyMonkey. This allowed me to easily and inexpensively reach all employees throughout the country. I had access to all employees since all individuals were provided with laptops and email addresses and I was able to establish a distribution list to include all employees.

Data Collection Methods

I developed a 30-question, 5-point Likert scale survey to measure the degree to which employees buy into the corporate-wide operational excellence initiative. The first 15 questions used a positively slanted Likert scale (Strongly Agree, Slightly Agree, Neither Agree nor Disagree, Slightly Disagree, and Strongly Disagree) while the last 15 questions used a negatively slanted Likert scale (Strongly Disagree, Slightly Disagree, Neither Disagree nor agree, Slightly Agree, and Strongly Agree). A 1-5 scoring system was used with lower numbers indicating agreement with the question (1=strongly agree) while higher numbers indicated disagreement (5=strongly disagree). I chose a 5-point Likert scale since the selection of the "neutral" option for a response indicates a level of ignorance and/or indifference that is very important for this study. In other words, although the expectation may be for employees to respond either negatively or positively to these questions (indicating an emotional reaction one way or the other), the neutral response may indicate a lack of insight and/or interest that is very informative. The survey questions were organized into different constructs to include OE comprehension, engagement, and leadership awareness. The questions in each construct are displayed in Table 1. A qualitative component that would involve open-ended questions and even

personal interviews would certainly provide additional valuable information, but this will need to be a future area of research given my status as an employee of the company.

Table 1

Dependent Variables by Construct and Descriptive Statistics (n=204)

Dependent Variable Constructs	n
OE Comprehension	
I don't understand how OE relates to my current role in the company	204
I cannot name any of the key OE focus areas	202
I don't understand the purpose of our company's corporate OE vision	202
The understanding of OE is not consistent among the workforce	202
The purpose of OE has never been fully explained to me	200
Safety and efficiency are two of the five components of OE. I can name the other three	200
I understand the Tenets of Operation	202
I believe that my co-workers understand the Tenets of Operation	198
I understand the company's corporate vision for Operational Excellence	201
I understand the OE responsibilities that are specific to my role within the company	200
OE Engagement	
I think that OE requirements "get in the way" of the work that needs to be done	202
The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	203
For the type of work that I perform, engagement with OE is meaningless	203
Training courses and meetings in OE expectations and execution would not be of any benefit to me	197
Training courses and meetings in OE expectations and execution are not of any interest to me	203
I would like to participate in training and/or courses to develop a better understanding of OE	202
I believe that the company is committed to encouraging OE engagement on all levels within the company	200
I believe that my co-workers are interested in participating in OE-type activities	202
I am aware of opportunities to participate in OE	200
I have participated in an OE-related training or workshop in the last year	202
OE Leadership Awareness	
I don't think that my manager demonstrates the OE culture	203
I don't think that my current staff (direct reports) actively participate in OE	201

My work group's current organizational culture does not lend itself to effective OE implementation	201
My current manager does not actively emphasize OE expectations among the team	203
I think that the company is spending too much time and money in OE	203
I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	202
My manager has actively contributed to providing me with a better understanding of OE	201
I think that the current management structure in which I work is fully committed to OE	202
My current manager is very knowledgeable about OE	199
My current manager has expressed his/her desire to increase OE participation among our team	201

Data Analysis Methods

SPSS software was used to analyze the survey data, and regression analysis to document correlations between perceptions of operational excellence (organized by construct) and a variety of demographic variables. The objective was to identify any correlations or patterns that might exist in terms of the types of individuals who appear to embrace (or not) the corporate initiative of operational excellence.

Regression coefficients were calculated in order to determine the strength of the linear relationships between variables. For each of these coefficients, t-tests were conducted at the $p \leq .05$ level to determine whether the variable in question had a non-zero effect on the model's dependent variable. Since individual perceptions can be either positive or negative, two-tailed tests were used to measure whether the direction of one group differs from the second (regardless of whether it is positive or negative).

F-tests were used to test three sorts of hypotheses. First, they were used to determine whether, taken together, the model's variables serve as significant predictors of a particular model's dependent variable. Second, when groups of independent variables

were added to regression models, F-tests can determine if, taken together, that group of variables acts as a significant predictor of the model's dependent variable. Finally, F-tests were used to compare the variances across the three different constructs (employee comprehension, employee engagement, and leadership awareness) with respect to the independent variables.

The effectiveness with which the company is currently implementing operational excellence can be ascertained, in part, through these survey questions that focus on employee comprehension, engagement, and the current leadership within the work structure of each employee. In terms of comprehension, the survey includes questions that focus on the relationship between OE and the employee's current role, awareness of key OE concepts, and the purpose and objective of the OE vision. Survey questions related to employee engagement include awareness of, and participation in, OE seminars and training sessions. Finally, the survey questions related to leadership awareness focus on employee perceptions with respect to managerial commitment to and knowledge of OE, communication of OE principles by management, and managerial dedication to the development of direct reports within the OE vision. The survey instrument includes ten questions for each of these three constructs.

In terms of reliability, the survey was administered in the exact same way (online invitation via SurveyMonkey) and each employee was given the same amount of time to respond as well as the same number of email reminders. Reliability measures the extent to which the method used provides "data with consistent results, especially if the study is repeated by others" (Polonsky and Waller, 2011, p. 128). In addition, the survey

questions were formulated with the assistance of corporate OE and HR management personnel in order to ensure the use of appropriate structure and language.

Potential Limitations and Significance of Study

This research study encompassed 300 employees from a small division within a large global energy company that has over 60,000 employees worldwide. As a result, the findings from this research study cannot be generalized to all employees across all divisions or more broadly to the industry as a whole. Given that this particular division was relatively new to the company (14 years) and involved work activities that were different from the "core business" of the corporation, the individual perspectives of the division's employees should be viewed in this light.

It is also important to consider the data gathering processes. Surveys in and of themselves provide a "pulse" in terms of what individuals believe and feel at a given moment of time, but the accuracy, validity and significance of the data should should not be assumed to remain unchanged. As part of social desirability bias, individuals often respond to surveys with personal agenda items that can severely distort the results, including disinterest, fear, preservation of job security, or even sabotage. Individuals can tend to respond to such questions more in terms of what they think *should be* answered, rather than an actual state of mind or an accurate reflection upon the current organizational reality. In addition, HR and OE personnel in the division were invited to participate in the survey and clearly, these individuals could have more knowledge of and investment in OE than other employees.

Non-response bias must also be considered given the uncertainty as to the extent to which the respondents were representative of all of the individuals who received the

survey. In addition, certain demographic variables such as age, gender and race/ethnicity were identified by HR as variables that could not be included in the survey, which could reuslt in specification error in the regression models. As an example, if the literature indicates that women are more likely to engage in OE activities than men, the absence of this information could bias the regression coefficients of any variables included in the model that were correlated with gender. It must also be noted that individuals who work primarily in the field have considerably less access to their computers and email accounts, thus making it less likely for these individuals to participate. Finally, it is very likely that certain individuals are far busier than others are and would thus be less likely to respond.

Although potential coverage errors were addressed in this study in that every employee in this division was provided the opportunity and appropriate amount of time to respond to the survey), measurement error is more subtle, difficult and complex. Since the survey questions needed to be reviewed and approved by legal, OE, and HR personnel, there were a variety of independent variables that were of interest but were not able to be included (e.g. age and gender). In addition, the wording of the questions themselves were structured in a manner that may not represent the most insightful and effective approach through which to tease out the actual perspective.

Another important limitation is that surveys - as single, cross-sectional studies - do not delve deeply into the unique conditions (i.e. age of the organization, current market conditions, industry type, financial stability, etc.) of the respective organizations nor do they take into account longitudinal impacts (Schminke, et al., 2005). The

following chapter will include the results of the study as well as an analysis of these findings within the context of the problem statement.

CHAPTER 4

ANALYSIS AND FINDINGS

In this chapter, I describe the analyses designed to test a series of null hypotheses that the study coefficients are equal to zero, which indicates that the demographic variables have no effect on the particular dependent variable. These analyses will include a review of the correlation coefficients to test for linear relationships, t-tests to analyze whether variables have a non-zero effect on the model's dependent variables, and finally F-tests to compare variances across constructs and to determine the predictability of the corresponding dependent variables. The discussion begins with a demographic review of the sample.

Sample

This analysis was based upon a sample of 204 employees within a division of approximately 300 individuals. Descriptive statistics for the sample are provided in Appendix E. The sample population included employees from five divisions (West, Mountain, Midwest, South, and East) across the United States. Of the 204 employees, 133 were from the West office, 11 from the Mountain office, 42 from the Midwest office, 11 from the South office, and seven from the East office. The employees were also from one of three business units: Public Sector (149), CVX Support Business Unit (26) and Renewable Power (29). In terms of whether the sample employees were based in the office or in the field, 169 identified themselves as office-based with the remaining 35 from the field. In response to employment tenure, 70 employees had been with the company for five years or less, 61 individuals noted 6-10 years, 57 employees responded 11-20 years, and 16 employees had been with the company for more than 20 years. Of the 204 respondents, 172 had received at least a two-year degree with 65 of those

receiving graduate or doctoral degrees. In terms of prior attendance at seminars in OE, 122 employees responded affirmatively while the remaining 82 were either "no" (54) or "I am not sure" (28). Thus, 40.2% of the employees had either not participated in a prior OE event or were not sure if they had.

Distribution of Responses

An analysis of the distribution of responses for each of the dependent variables generally indicates that employees responded favorably to the questions that focused on OE comprehension and leadership awareness. As noted in Table 2, 188 of the 204 respondents either slightly or strongly disagreed with this statement indicating a lack of OE comprehension. This was also found to be the case for questions related to focus, participation, and interest in OE training.

Table 2

Distribution of Responses to the Statement: I do not understand the purpose of our firm's corporate OE Vision

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	4	2.0	2.0	2.0
Slightly Agree	6	2.9	3.0	5.0
Neither Agree nor Disagree	4	2.0	2.0	6.9
Slightly Disagree	32	15.7	15.8	22.8
Strongly Disagree	156	76.5	77.2	100.0
Total	202	99.0	100.0	

Mean=4.63

In the tables showing the distribution of responses for the dependent variables "The understanding of OE is not consistent among the workforce" and "Safety and efficiency are two of the key components of OE; I can name the other three", a different picture is presented. As per Table 3, 78 respondents (38.6%) either slightly or strongly

agreed with this statement while another 31 respondents (15.3%) neither agreed nor disagreed. These dependent variables will be examined in detail in the section on F-tests.

Table 3

Distribution of Responses to the Statement: The understanding of OE is not consistent among the workforce

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	17	8.3	8.4	8.4
Slightly Agree	61	29.9	30.2	38.6
Neither Agree nor Disagree	31	15.2	15.3	54.0
Slightly Disagree	44	21.6	21.8	75.7
Strongly Disagree	48	23.5	23.8	99.5
Not Applicable	1	.5	.5	100.0
Total	202	99.0	100.0	

Mean=3.24

In Table 4, the distribution of response results are shown for the dependent variable "safety and efficiency are two of the five key components of OE; I can name the other three." For this statement, 125 (62.5%) of the respondents either slightly or strongly agreed while 37.5% (75 respondents) either slightly or strongly disagreed or neither agreed nor disagreed. Given the sizable proportion (53.9% and 37.5%) of respondents who did not respond in a manner that indicates individual and consistent OE comprehension, another level of analysis would provide additional insights as to the "profile" of individuals who provided these responses.

Table 4

Distribution of Responses to the Statement: Safety and efficiency are two of the five key components of OE. I can name the other three

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	73	35.8	36.5	36.5
Slightly Agree	52	25.5	26.0	62.5
Neither Agree nor Disagree	19	9.3	9.5	72.0
Slightly Disagree	37	18.1	18.5	90.5
Strongly Disagree	19	9.3	9.5	100.0
Total	200	98.0	100.0	

Mean=2.39

Correlation Coefficients

Using SPSS, bivariate correlations were generated for the variables and the results are shown in Appendix F. While a value of -1 or 1 indicates a perfect association between two variables, a value of 0 indicates no association between these variables. The data in Appendix F indicates whether a particular correlation is significant at the 0.05 level or at the 0.01 level (2-tailed). In general terms, correlation coefficients are considered small when they range from .10 to .30, medium when .31 to .50, or large when .51 to 1.0. As shown in Appendix F, no large correlation coefficients were discovered in this study. However, the following section will examine nine models that identified medium and small correlation coefficients in the data.

The first was the independent variable: “Have I attended any type of seminar and/or courses in Operational Excellence” with the dependent variable: “I am aware of opportunities to participate in OE.” As per Table 5, the correlation coefficient (R-Value) was .31 and the R-square statistic for this model was .10, which indicates that the independent variable included in this model accounted for 10% of the explained variation

for the likelihood of indicating awareness of opportunities to participate in OE. The estimated coefficient for "Have I attended any type of seminar and/or courses in Operational Excellence (OE)" was .51. In other words, a one-unit increase in this independent variable corresponded with a .51 increase in the dependent variable "I am aware of opportunities to participate in OE." Since the "no" (score=2) and "I am not sure" (score=3) responses are higher than the "yes" (score=1) response, this suggests at the $p \leq .01$ level that employees who have attended OE courses are more likely to be aware of opportunities to participate in OE.

Table 5

Model 1: Awareness of opportunities to participate in OE

Independent Variable	Beta	Estimated Coefficient	T	Sig.
(Constant)		1.40	7.47	.00
Have I attended any type of seminar and/or courses in Operational Excellence (OE)	.31	.51	4.55	.00

$R^2 = .10$

In the second medium correlation coefficient found, the independent variable was "Have I attended any type of seminar and/or courses in Operational Excellence (OE)" and the dependent variable was "I have participated in an OE-related training or workshop in the last year." As per Table 6, the R-value was found to be .35 and the R-square statistic for this model was .12, which indicates that the independent variable included in this model accounted for 12% of the explained variation for the likelihood of indicating participation in OE training or workshops in the past year. The estimated coefficient for "Have I attended any type of seminar and/or courses in Operational

Excellence (OE)" was .72. In other words, a one-unit increase in this independent variable corresponded with a .72 increase in the dependent variable "I have participated in an OE training or workshop in the past year." Since the "no" (score=2) and "I am not sure" (score=3) responses are higher than the "yes" (score=1) response, this suggests at the $p \leq .01$ level that employees who have attended OE courses are more likely to have participated in an OE-related training or workshop in the past year.

Table 6

Model 2: Participation in OE Training or Workshops in Past Year

Independent Variable	Beta	Estimated Coefficient	T	Sig.
(Constant)		1.23	5.26	.00
Have I attended any type of seminar and/or courses in Operational Excellence (OE)	.35	.72	5.24	.00

$R^2 = .12$

In the third medium correlation coefficient found, the independent variable was "My role within the company" and the dependent variable was "I don't think that my current staff (direct reports) actively participates in OE." As per Table 7, the R-value was found to be .37 and the R-square statistic for this model was .13, which indicates that the independent variable included in this model accounted for 13% of the explained variation for the likelihood of indicating that direct reports/current staff do not actively participate in OE. The estimated coefficient for "My role within the company" was -.47. In other words, a one-unit increase in this independent variable corresponded with a .47 *decrease* in the dependent variable "I don't think that my current staff (direct reports) actively participate in OE." Since the "strongly agree" response had a "score" of 1, the

"strongly disagree" response a score of 5, the "individual contributor" a score of 1, and the "senior manager" a score of 4, this suggests at the $p \leq .01$ level that senior employees were more likely to disagree with the assertion that current staff does not actively participate in OE.

Table 7

Model 3: Current Staff (direct reports) active participation in OE

Independent Variable	Beta	Estimated Coefficient	T	Sig.
(Constant)		5.76	38.29	.00
My role within the company	-.37	-.47	-5.53	.00

$R^2 = .13$

In the fourth statistically significant correlation coefficient found, the independent variable was "Have I attended any type of seminar and/or courses in OE" and the dependent variable was "I do not understand how OE relates to my current role in the company." As per Table 8, the R-value was .17 and the R-square statistic for this model was .03, which indicates that the independent variable included in this model accounted for 3% of the explained variation for the likelihood of indicating a lack of understanding how OE relates to the employee's role in the company. The estimated coefficient for "Have I attended any type of seminar and/or courses in Operational Excellence (OE)" was -.30. In other words, a one-unit increase in this independent variable corresponded with a .30 *decrease* in the dependent variable "I do not understand how OE relates to my current role in the company." Since the "strongly agree" response had a "score" of 1, the "strongly disagree" response a score of 5, and the "no" (score=2) and "I am not sure" (score=3) responses are higher than the "yes" (score=1), this suggests at the $p \leq .01$ level

that employees who have attended OE courses are more likely to disagree with the assertion that they do not understand how OE relates to their current role within the company.

Table 8

Model 4: Understanding of how OE relates to current role in the company

Independent Variable	Beta	Estimated Coefficient	T	Sig.
(Constant)		4.83	22.96	.00
Have I attended any type of seminar and/or courses in Operational Excellence (OE)	-.17	-.30	-2.46	.02

$R^2 = .03$

In the fifth statistically significant correlation coefficient found, the independent variable was "Years with the company" and the dependent variable was "The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise." As per Table 9, the R-value was .20 and the R-square statistic for this model was .04, which indicates that the independent variable included in this model accounted for 4% of the explained variation for the likelihood of indicating that the corporation's leaders need to focus their attention on non-OE issues. The estimated coefficient for "Years with the company" was -.22. In other words, a one-unit increase in this independent variable corresponded with a .22 *decrease* in the dependent variable "The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise." While the "strongly agree" response had a "score" of 1 and the "strongly disagree" response a score of 5, a tenure of 5 years or less had a score of 1 and more than 20 years a score of 4. This suggests at the $p \leq .01$ level that employees

who have a shorter tenure with the company are more likely to disagree with the assertion that the corporation's leaders need to focus their attention on much more important issues than on developing OE expertise.

Table 9

Model 5: Corporation's leaders need to focus their attention on non-OE issues

Independent Variable	Beta	Estimated Coefficient	T	Sig.
(Constant)		4.65	27.01	.00
Years with the company	-.20	-.22	-2.94	.00

$R^2 = .04$

In the sixth statistically significant correlation coefficient found, the independent variable was "Years with the company" and the dependent variable was "The understanding of OE is not consistent among the workforce." As per Table 10, the R-value was .19 and the R-square statistic for this model was .03, which indicates that the independent variable included in this model accounted for 3% of the explained variation for the likelihood of indicating that OE understanding is not consistent among the workforce. The estimated coefficient for "Years with the company" was -.26. In other words, a one-unit increase in this independent variable corresponded with a .26 *decrease* in the dependent variable "The understanding of OE is not consistent among the workforce." While the "strongly agree" response had a "score" of 1 and the "strongly disagree" response a score of 5, a tenure of 5 years or less had a score of 1 and more than 20 years a score of 4. This suggests at the $p \leq .05$ level that employees who have a shorter tenure with the company are more likely to disagree with the assertion that the understanding of OE is not consistent among the workforce.

Table 10

Model 6: OE understanding is not consistent among the workforce

Independent Variable	Beta	Estimated Coefficient	T	Sig.
(Constant)		3.77	17.00	.00
Years with the company	-.19	-.26	-2.67	.01

$R^2 = .04$

In the seventh statistically significant correlation coefficient found the independent variable was "If a college graduate, was engineering or construction management studied" and the dependent variable was "For the type of work that I perform, engagement with OE is meaningless." As per Table 11, the R-value was .19 and the R-square statistic for this model was .04, which indicates that the independent variable included in this model accounted for 4% of the explained variation for the likelihood of indicating that OE is meaningless for the type of work performed by the employee. The estimated coefficient for "If college graduate, was engineering or construction management studied" was -.19. In other words, a one-unit increase in this independent variable corresponded with a .19 *decrease* in the dependent variable "For the type of work that I perform, engagement with OE is meaningless." While the "strongly agree" response had a "score" of 1 and the "strongly disagree" response a score of 5, a "yes" response had a score of 1 and "no" a score of 2. This suggests at the $p \leq .01$ level that employees who studied engineering or construction management are more likely to disagree with the assertion that OE is meaningless for the type of work that they perform.

Table 11

Model 7: OE is meaningless for the type of work that I perform

Independent Variable	Beta	Estimated Coefficient	T	Sig.
(Constant)		5.02	39.16	.00
If college graduate, did I study construction management and/or engineering?	-.19	-.19	-2.72	.01

$R^2 = .04$

In the eighth statistically significant correlation coefficient found, the independent variable was "Business Unit" and the dependent variable was "My current manager does not actively emphasize OE expectations among the team." For this model, dummy variables were used to show the effect of each different business unit.

As per Table 12, for the "Public Sector" business unit the R value was .18 and the R-square statistic for this model was .03, which indicates that the independent variable (Public Sector) included in this model accounted for 3% of the explained variation for the likelihood of indicating that the employee's current manager does not actively emphasize OE expectations. The estimated coefficient for "Public Sector" is -.37. In other words, a one-unit increase in this independent variable corresponded with a .37 decrease in the dependent variable "My current manager does not actively emphasize OE expectations among the team." While the "strongly agree" response had a "score" of 1 and the "strongly disagree" response a score of 5, the Public Sector business unit had a score of 1 and the dummy variable a score of 0. This suggests at the $p \leq .01$ level that employees in the Public Sector unit are more likely to agree with the assertion that OE expectations are not emphasized by current management in that unit.

For the "CVX Support" business unit, the model was not statistically significant (p=.25). However, for the Renewable Power business unit the R-value was .15 and the R-square statistic for this model was found to be .02, which indicates that the independent variable (Renewable Power) included in this model accounted for 2% of the explained variation for the likelihood of indicating that the employee's current manager does not actively emphasize OE expectations. The estimated coefficient for "Renewable Power" was .38. In other words, a one-unit increase in this independent variable corresponded with a .38 increase in the dependent variable "My current manager does not actively emphasize OE expectations among the team." While the "strongly agree" response had a "score" of 1 and the "strongly disagree" response a score of 5, the Renewable Power business unit had a score of 1 and the dummy variable a score of 0. This suggests at the $p \leq .05$ level that employees in the Renewable Power business unit are more likely to *disagree* with the assertion that OE expectations are not emphasized by current management in that unit.

The final model used the Public Sector and Renewable Power business units together, with the CVX business unit omitted to avoid the dummy variable trap. This model was not statistically significant (p=.21).

Table 12

Model 8: My current manager does not actively emphasize OE expectations

Independent Variable	Beta	Estimated Coefficient	T	Sig.
BU (Public Sector)	-.18	-.37	-2.63	.01
BU (CVX Support)	.08	.22	1.16	.25
BU (Renewable Power)	-.15	.38	2.13	.04
BU (Public+Renewable) (CVX Support Omitted)	-.09	-.23	-1.25	.21

R^2 = .04
R^2 = .01
R^2 = .02
R^2 = .01

In the final statistically significant correlation coefficient found, the independent variable was "Business Unit" and the dependent variable was "I have participated in an OE-related training or workshop in the last year." For this model, dummy variables were also used to show the effect of each different business unit.

As per Table 13, for the "Public Sector" business unit the R-value was .19 and the R-square statistic for this model was .04, which indicates that the independent variable (Public Sector) included in this model accounted for 4% of the explained variation for the likelihood of indicating participation in OE training or workshops in the past year. The estimated coefficient for "Business Unit" was .66. In other words, a one-unit increase in this independent variable corresponded with a .66 increase in the dependent variable "I have participated in an OE training or workshop in the past year." While the "strongly agree" response had a "score" of 1 and the "strongly disagree" response a score of 5, the Public Sector business unit had a score of 1 and the dummy variable a score of 0. This

suggests at the $p \leq .01$ level that employees in the Public Sector business unit were more likely NOT to have participated in an OE-related training or workshop in the past year.

For the "CVX Support" business unit, the R value was .17 and the R-square statistic for this model was found to be .03, which indicates that the independent variable (CVX Support) included in this model accounted for 3% of the explained variation for the likelihood of indicating participation in OE training or workshops in the past year. The estimated coefficient for "CVX Support" was -.79. In other words, a one-unit increase in this independent variable corresponded with a .79 decrease in the dependent variable "I have participated in an OE-related training or workshop in the past year." While the "strongly agree" response had a "score" of 1 and the "strongly disagree" response a score of 5, the CVX Support business unit had a score of 1 and the dummy variable a score of 0. This suggests at the $p \leq .01$ level that employees in the CVX Support business unit are more likely to have participated in an OE-related training or workshop in the past year. Finally, for the "Renewable Power" business unit, the model was not statistically significant ($p=.32$).

The final model used the Public Sector and Renewable Power business units together, with the CVX business unit omitted to avoid the dummy variable trap. For this model, the R-value was .19 and the R-square statistic for this model was found to be .03, which indicates that the independent variable (Public Sector+Renewable) included in this model accounted for 3% of the explained variation for the likelihood of indicating participation in OE training or workshops in the past year. The estimated coefficient was .82. In other words, a one-unit increase in this independent variable corresponded with a .82 increase in the dependent variable "I have participated in an OE-related training or

workshop in the past year." While the "strongly agree" response had a "score" of 1 and the "strongly disagree" response a score of 5, the Public Sector+Renewable business unit had a score of 1 and the dummy variable a score of 0. This suggests at the $p \leq .01$ level that employees in the Public Sector and Renewable Power business units are more likely to have participated in an OE-related training or workshop in the past year.

Table 13

Model 9: Participation in OE Training or Workshops in Past Year

Independent Variable	Beta	Estimated Coefficient	t	Sig.
BU (Public Sector)	.19	.66	2.80	.01
BU (CVX Support)	-.17	-.79	-2.51	.01
BU (Renewable Power)	.07	-.30	-.99	.32
BU (Public Sector+Renewable) (CVX Support Omitted)	.19	.82	2.66	.01

$R^2 = .04$
$R^2 = .03$
$R^2 = .01$
$R^2 = .03$

T-Tests

The second phase of the analysis involves first identifying those independent variables that displayed a significant bivariate correlation with one of the dependent variables, then conducting t-tests on the resulting regression coefficients to determine whether the variable in question has a non-zero effect on the model's dependent variable. As per the t-Distribution table, if the degrees of freedom exceed 120 for a two-tailed test at the .05 level the t-value is 1.96. As a result, the variable in question can only be determined to have a non-zero effect if the resulting absolute value of the t-value is *greater* than 1.96.

In this study, 30 correlation coefficients were significant at the 0.05 level (as highlighted in yellow in Appendix F). Among the independent variables, the "Have I attended any type of seminar and/or courses in Operational Excellence (OE)" variable was found to have the most statistically significant correlations (10) followed by "Business Unit" with seven. For each of the dependent variables, linear regression models were generated in SPSS. Appendix G shows the key descriptive statistics by independent variable. In this table, all of the t-values exceed 1.96. As a result, the null hypotheses that these independent variables have a non-zero effect on the indicated dependent variables can be rejected.

Among the independent variables, "Have I attended any type of seminar and/or courses in OE" had the greatest number (ten) of t-values that exceeded the threshold value of 1.96 in the t-testing process. As shown in Table 14, these dependent variables were: "I do not understand how OE relates to my current role in the company" (-2.46), "I cannot name any of the key OE focus areas" (-3.05), "The purpose of OE has never been fully explained to me" (-3.35), "Safety and efficiency are two of the five key components; I can name the other three" (3.55), "I understand the OE responsibilities that are specific to my role" (3.24), "My manager has actively participated in providing me with a better understanding of OE (2.73), "I am aware of opportunities to participate in OE" (4.55), "My current manager is very knowledgeable about OE" (2.12), "My current manager has expressed his desire to increase OE participation among our team" (2.30), and "I have participated in OE-related training in the past year" (5.24). Taken together, these results make sense in that the null hypothesis that suggests that employees who

have attended OE seminars would have no effect on OE participation, awareness and comprehension can be rejected.

Table 14

Statistically Significant T-Values: Attendance of OE Seminars/Courses

Independent Variable	Dependent Variable	Beta	R^2	Estimated Coefficient	t	Sig.
Have I attended any type of seminar and/or courses in Operational Excellence (OE)?	I do not understand how OE relates to my current role in the company	.17	.03	-.30	-2.46	.02
	I cannot name any of the key OE focus areas	.21	.04	-.31	-3.05	.00
	The purpose of OE has never been fully explained to me	.23	.05	-.31	-3.35	.00
	Safety and efficiency are two of the five key components of OE. I can name the other three	.25	.06	.47	3.55	.00
	I understand the OE responsibilities that are specific to my role within the company	.23	.05	.25	3.24	.00
	My manager has actively contributed to providing me with a better understanding of OE	.19	.04	.27	2.73	.01
	I am aware of opportunities to participate in OE	.31	.10	.51	4.55	.00
	My current manager is very knowledgeable about OE	.15	.02	.20	2.12	.04
	My current manager has expressed his desire to increase OE participation among our team	.16	.03	.24	2.30	.02
	I have participated in an OE-related training or workshop in the past year	.35	.12	.72	5.24	.00

For the independent variable “business unit”, the correlations between the dependent variables and the dummy variables that represent the type of business unit were examined. The “Public Sector” business unit had eight t-values greater than 1.96 in the t-testing process. These are shown in Table 15. The dependent variables were: “I don’t think that my manager demonstrates the OE culture” (-2.16); “My current manager

does not actively emphasize OE expectations among the team" (-2.63); "Safety and efficiency are two of the five key components; I can name the other three" (3.28); "I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations" (2.11); "I understand the OE responsibilities that are specific to my role within the company" (2.51); "I am aware of opportunities to participate in OE" (2.38); "My current manager is very knowledgeable about OE" (3.06); and "I have participated in an OE-related training or workshop within the past year" (2.80). These results indicate that the null hypothesis that the business unit of employees has no effect on OE comprehension or active engagement in OE-related training can be rejected.

Table 15

Statistically Significant T-Values: Business Unit (Public Sector)

Independent Variable	Dependent Variable	Beta	R^2	Estimated Coefficient	t	Sig.
Business Unit (Public Sector)	I don't think that my manager demonstrates the OE culture	.15	.02	-.32	-2.16	.03
	My current manager does not actively emphasize OE expectations among the team	.18	.03	-.37	-2.63	.01
	Safety and efficiency are two of the five key components of OE. I can name the other three	.23	.05	.71	3.28	.00
	I believe that my manager is committed to developing direct reports who can work successfully within OE expectations	.15	.02	.29	2.11	.04
	I understand the OE responsibilities that are specific to my role within the company	.18	.03	.31	2.51	.01
	I am aware of opportunities to participate in OE	.17	.03	.44	2.38	.02
	My current manager is very knowledgeable about OE	.21	.05	.48	3.06	.00
	I have participated in an OE-related training or workshop in the last year	.19	.04	.66	2.80	.01

The "CVX Support" business unit had four t-values greater than 1.96 in the t-testing process. These are shown in Table 16. The dependent variables were: "Safety and efficiency are two of the five key components; I can name the other three" (-3.10); "I understand the OE responsibilities that are specific to my role within the company" (-2.65); "My current manager is very knowledgeable about OE" (-2.51); and "I have participated in an OE-related training or workshop within the past year" (-2.51). These results indicate that the null hypothesis that the Public Sector business unit of employees

has no effect on OE comprehension or active engagement in OE-related training can be rejected.

Table 16

Statistically Significant T-Values: Business Unit (CVX Support)

Independent Variable	Dependent Variable	Beta	R^2	Estimated Coefficient	t	Sig.
Business Unit (CVX Support)	Safety and efficiency are two of the five key components of OE. I can name the other three	.22	.05	-.90	-3.10	.00
	I understand the OE responsibilities that are specific to my role within the company	.19	.03	-.44	-2.65	.01
	My current manager is very knowledgeable about OE	.18	.03	-.52	-2.51	.01
	I have participated in an OE-related training or workshop in the last year	.17	.03	-.79	-2.51	.01

The “Renewable Power” business unit had two t-values greater than 1.96 in the t-testing process. These are shown in Table 17. The dependent variables were: “The understanding of OE is not consistent among the workforce” (2.35) and “My current manager does not actively emphasize OE expectations among the team” (2.13). These results indicate that the null hypothesis that the Renewable Power business unit of employees has no effect on OE comprehension or leadership expectations can be rejected.

Table 17

Statistically Significant T-Values: Business Unit (Renewable Power)

Independent Variable	Dependent Variable	Beta	R^2	Estimated Coefficient	t	Sig.
Business Unit (Renewable Power)	The understanding of OE is not consistent among the workforce	.16	.03	.64	2.35	.02
	My current manager does not actively emphasize OE expectations among the team	.15	.02	.38	2.13	.04

Finally, the Public Sector and Renewable Power business units were tested together, with the CVX business unit omitted to avoid the dummy variable trap. The "Public Sector+Renewable Power" business unit model had five t-values greater than 1.96 in the t-testing process. These are shown in Table 18. The dependent variables were: "My current manager does not actively emphasize OE expectations among the team" (2.13); "Safety and efficiency are two of the five key components of OE; I can name the other three" (2.05); "I understand the OE responsibilities that are specific to my role within the company" (2.15); "My current manager is very knowledgeable about OE" (2.32); and "I have participated in an OE-related training or workshop in the last year" (2.25). These results indicate that the null hypothesis that the Public Sector+Renewable Power business units of employees has no effect on OE comprehension, engagement and leadership expectations can be rejected.

Table 18

Statistically Significant T-Values: Business Unit (Public Sector+Renewable Power)

Independent Variable	Dependent Variable	Beta	R^2	Estimated Coefficient	t	Sig.
Business Unit (Public+Renewable) with CVX omitted	My current manager does not actively emphasize OE expectations among the team	.19	.04	.15	2.68	.01
	Safety and efficiency are two of the five key components of OE. I can name the other three	.20	.04	-.24	-2.82	.01
	I understand the OE responsibilities that are specific to my role within the company	.15	.02	-.10	-2.10	.04
	My current manager is very knowledgeable about OE	.19	.04	-.17	-2.77	.01
	I have participated in an OE-related training or workshop in the past year	.17	.03	-.22	-2.46	.02

The independent variable "years with the company" had three t-values greater than 1.96 in the t-testing process. These results are shown in Table 19. The dependent variables were "The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise" (-2.94), "The understanding of OE is not consistent among the workforce" (-2.66), and "I think that the company is spending too much time and money on OE" (-2.81). These results indicate that the null hypothesis that employment tenure has no effect on OE comprehension or perceived importance can be rejected.

Table 19

Statistically Significant T-values: Years with the Company

Independent Variable	Dependent Variable	Beta	R^2	Estimated Coefficient	t	Sig.
Years with the Company	The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	.20	.04	-.22	-2.94	.00
	The understanding of OE is not consistent among the workforce	.19	.03	-.26	-2.66	.01
	I think that the company is spending too much time and money on OE	.20	.04	-.20	-2.81	.01

The independent variables “My role within the company”, “If college graduate, did I study Engineering or Construction Management”, “Primary work environment”, and “My current organizational structure” each were found to have two t-values greater than 1.96 in the t-testing process. These results are shown in Table 20. For the company role variable, the dependent variables were “The understanding of OE is not consistent among the workforce” (-2.06) and “I don’t think that my current staff actively participates in OE” (-5.53). For the educational background variable, the dependent variables were “For the type of work I perform, OE engagement is meaningless” (-2.72) and “I believe that the company is committed to encouraging OE engagement on all levels” (2.94). For the primary work environment variable, the dependent variables were “Training courses and meetings in OE expectations and execution are not of any interest to me” (2.36) and “I understand the Tenets of Operation” (-1.99). Finally, for the current organizational structure variable, the dependent variables were “Safety and efficiency are two of the five key components; I can name the other three” (-3.64), and “My current manager has expressed his desire to increase OE participation among the team” (-2.42). These results

indicate that the null hypotheses that company role, educational background, primary work environment, and current organizational structure have no effect on engagement and commitment to OE can be rejected. The inverse effect of educational background on OE engagement suggests that employees who studied engineering or construction management are less likely to find OE engagement to be meaningless.

Table 20

Statistically Significant T-Values: Company Role, Educational Background, Primary Work Environment and Current Organizational Structure

Independent Variable	Dependent Variable	Beta	R^2	Estimated Coefficient	t	Sig.
My role within the company	The understanding of OE is not consistent among the workforce	-.14	.02	-.22	-2.06	.04
	I don't think that my current staff (direct reports) actively participate in OE	-.37	.13	-.47	-5.53	.00
Primary Work Environment	Training courses and meetings in OE expectations and execution are not of any interest to me	.16	.03	.37	2.36	.02
	I understand the Tenets of Operation	.14	.02	-.32	-1.99	.05
If college graduate, did I study construction management and/or engineering?	For the type of work that I perform, engagement with OE is meaningless	.19	.04	-.19	-2.72	.01
	I believe that the company is committed to encouraging OE engagement on all levels within the company	.20	.04	.21	2.94	.00
My current organizational structure	Safety and efficiency are two of the five key components of OE. I can name the other three	.25	.06	-.42	-3.64	.00
	My current manager has expressed his desire to increase OE participation among our team	.17	.03	-.22	-2.42	.02

As shown in Table 21, the independent variable “highest level of educational attainment” was found to have only one t-value greater than 1.96. For the highest level of

education variable, the dependent variable was “I don’t think that my current staff actively participates in OE” (2.22).

Table 21

Statistically Significant T-Values: Highest Education Level

Independent Variable	Dependent Variable	Beta	R^2	Estimated Coefficient	t	Sig.
Highest level of educational attainment	I don't think that my current staff (direct reports) actively participate in OE	.16	.02	.18	2.22	.03

For the independent variable “geographic location”, the correlations between the dependent variables and the dummy variables that represent the geographic location were examined. The “West” business unit had only one t-value greater than 1.96 in the t-testing process, which was the dependent variable: “I believe that my co-workers understand the Tenets of Operation” (2.29). This result shows that while the West geographic location variable appears to have a minimal effect on the dependent variables, the null hypothesis that this variable has no effect on these variables can be rejected. The possibility of the existence of a Type I error (i.e. a conclusion that a statistically significant relationship exists between variables when it does not) should be noted for this independent variable given the absence of other relationships.

The “Midwest” business unit had two t-values greater than 1.96 in the t-testing process, which were the dependent variables: “The corporation’s leaders need to focus their attention on much more important issues than on developing OE expertise” (-1.98) and “I believe that my co-workers understand the Tenets of Operation” (-2.07).

The “East” business unit had four t-values greater than 1.96 in the t-testing process, which were for the dependent variables: “I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations” (2.21); “I believe that the company is committed to encouraging OE engagement on all levels within the company” (2.21); “My current manager is very knowledgeable about OE” (2.42); and “I have participated in an OE-related training or workshop in the last year” (2.25).

The “South” and “Mountain” business units did not have any t-values greater than 1.96 in the testing process. Finally, the West, Mountain, Midwest, and East locations were tested together, with the South location omitted to avoid the dummy variable trap. This final test did not have any t-values greater than 1.96 in the testing process. The statistically significant results at the $p \leq .05$ level are shown in Table 22.

Table 22

Statistically Significant T-Values: Geographic Location

Independent Variable	Dependent Variable	Beta	R^2	Estimated Coefficient	t	Sig.
Geographic Location (West)	I believe that my co-workers understand the Tenets of Operation	.16	.03	.33	2.29	.02
Geographic Location (Midwest)	The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	.14	.02	-.36	-1.98	.05
	I believe that my co-workers understand the Tenets of Operation	.15	.02	-.35	-2.07	.04
Geographic Location (East)	I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	.20	.04	.95	2.87	.01
	I believe that the company is committed to encouraging OE engagement on all levels within the company	.14	.02	.58	2.01	.05
	My current manager is very knowledgeable about OE	.16	.02	.83	2.21	.03
	I have participated in an OE-related training or workshop in the past year	.14	.02	1.14	1.99	.05

F-Tests

In this section, F-tests were used to analyze the predictability of the model's dependent variables as well as to determine variances across the three different constructs of OE comprehension, OE engagement, and current leadership structure. In other words, F-tests determine whether the model is a good fit for the data. A one-way analysis of variance test was used for each of the independent variables to determine whether these variables can serve as predictors of the dependent variables at the $p \leq .05$ level. The results of these tests are shown in Appendix H.

For the independent variable “Business Unit”, dummy variables were used to show the effect of each type of business unit on the dependent variables. For the “Public Sector” business unit, the null hypotheses that this variable has no effect at the $p \leq .05$ level on the following dependent variables can be rejected: “I don’t think that my manager demonstrates the OE culture” (F=4.67; Sig.=.03); “My current manager does not actively emphasize OE expectations among the team” (F=6.90; Sig.=.01); “Safety and efficiency are two of the five key components of OE; I can name the other three” (F=10.72; Sig.=.00); “I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations” (F=4.45; Sig.=.04); “I understand the OE responsibilities that are specific to my role within the company” (F=6.29; Sig.=.01); “I am aware of opportunities to participate in OE” (F=5.68; Sig.=.02); “My current manager is very knowledgeable about OE” (F=9.37; Sig.=.00); and “I have participated in an OE-related training or workshop in the last year” (F=7.86; Sig.=.01). The results are show in Table 23.

Table 23

One-Way ANOVA: Business Unit (Public Sector)

Independent Variable	Dependent Variable	F	Sig.
Business Unit (Public Sector)	I don't think that my manager demonstrates the OE culture	4.67	.03
	My current manager does not actively emphasize OE expectations among the team	6.90	.01
	Safety and efficiency are two of the five key components of OE. I can name the other three	10.72	.00
	I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	4.45	.04
	I understand the OE responsibilities that are specific to my role within the company	6.29	.01
	I am aware of opportunities to participate in OE	5.68	.02
	My current manager is very knowledgeable about OE	9.37	.00
	I have participated in an OE-related training or workshop in the past year	7.86	.01

For the "CVX Support" business unit, the null hypotheses that this variable has no effect at the $p \leq .05$ level on the following dependent variables can be rejected: "Safety and efficiency are two of the five key components of OE; I can name the other three" (F=9.58; Sig.=.00); "I understand the OE responsibilities that are specific to my role within the company" (F=7.00; Sig.=.01); "My current manager is very knowledgeable about OE" (F=6.27; Sig.=.01); and "I have participated in an OE-related training or workshop in the last year" (F=6.27; Sig.=.01). The results are shown in Table 24.

Table 24

One-Way ANOVA: Business Unit (CVX Support)

Independent Variable	Dependent Variable	F	Sig.
Business Unit (CVX Support)	Safety and efficiency are two of the five key components of OE. I can name the other three	9.58	.00
	I understand the OE responsibilities that are specific to my role within the company	7.00	.01
	My current manager is very knowledgeable about OE	6.27	.01
	I have participated in an OE-related training or workshop in the past year	6.27	.01

For the "Renewable Power" business unit, the null hypotheses that this variable has no effect at the $p \leq .05$ level on the following dependent variables can be rejected: "The understanding of OE is not consistent among the workforce" (F=5.54; Sig.=.02) and "My current manager does not actively emphasize OE expectations among the team" (F=4.53; Sig.=.04). The results are shown in Table 25.

Table 25

One-Way ANOVA: Business Unit (Renewable Power)

Independent Variable	Dependent Variable	F	Sig.
Business Unit (CVX Support)	The understanding of OE is not consistent among the workforce	5.54	.02
	My current manager does not actively emphasize OE expectations among the team	4.53	.04

In terms of the independent variable "Role within the Company", the null hypotheses that this variable has no effect at the $p \leq .05$ level on the following variables can be rejected: "The understanding of OE is not consistent among the workforce" (F=3.78; Sig.=.01); "I don't think that my current staff actively participate in OE" (F=11.83; Sig.=.00); "I think that the company is spending too much time and money on OE" (F=4.89; Sig.=.00); "My manager has actively contributed to providing me with a better understanding of OE" (F=3.16; Sig.=.03). These results are shown in Table 26.

Table 26

One-Way ANOVA: Role within the Company

Independent Variable	Dependent Variable	F	Sig.
My role within the company	The understanding of OE is not consistent among the workforce	3.78	.01
	I don't think that my current staff (direct reports) actively participate in OE	11.83	.00
	I think that the company is spending too much time and money on OE	4.89	.00
	My manager has actively contributed to providing me with a better understanding of OE	3.16	.03

For the independent variable "Geographic Location", dummy variables were used to show the effect of each geographical location on the dependent variables. The Mountain and South locations did not show any statistically significant effects on the dependent variables, indicating that the null hypotheses that these variables have no effect at the $p \leq .05$ level on the dependent variables cannot be rejected. In addition, the West, Mountain, Midwest and East locations were grouped together (with the South location omitted), but the F-testing did not indicate any statistically significant

relationship on the dependent variables. The null hypotheses that the variables shown in Table 27 have no effect at the p≤.05 level on the indicated dependent variables can be rejected.

Table 27

One-Way ANOVA: Geographic Location

Independent Variable	Dependent Variable	F	Sig.
Geographic Location (West)	I believe that my co-workers understand the Tenets of Operation	5.22	.02
Geographic Location (Midwest)	The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	3.92	.05
	I believe that my co-workers understand the Tenets of Operation	4.27	.04
Geographic Location (East)	I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	8.25	.01
	I believe that the company is committed to encouraging OE engagement on all levels within the company	4.06	.05
	My current manager is very knowledgeable about OE	4.88	.03
	I have participated in an OE-related training or workshop in the last year	3.97	.05

In terms of the independent variable "Primary Work Environment", the null hypotheses that this variable has no effect at the p≤.05 level on the following variables can be rejected: "Training courses and meetings in OE expectations and execution are not of any interest to me" (F=5.57; Sig.=.02) and "I understand the Tenets of Operation" (F=3.94; Sig.=.05). These results are shown in Table 28.

Table 28

One-Way ANOVA: Primary Work Environment

Independent Variable	Dependent Variable	F	Sig.
Primary Work Environment	Training courses and meetings in OE expectations and execution are not of any interest to me	5.57	.02
	I understand the Tenets of Operation	3.94	.05

For the independent variable "Years with the Company", the null hypotheses that this variable has no effect at the $p \leq .05$ level on the following dependent variables can be rejected: "The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise" (F=3.60; Sig.=.02); "The understanding of OE is not consistent among the workforce" (F=3.21; Sig.=.02); "I don't think that my current staff actively participates in OE (F=2.73; Sig.=.05); "For the type of work that I perform, engagement with OE is meaningless" (F=4.02; Sig.=.01); "Training courses and meetings in OE expectations and execution are not of any interest to me" (F=2.71; Sig.=.05); and "I think that the company is spending too much time and money on OE" (F=3.43; Sig.=.02). These findings are shown in Table 29.

Table 29

One-Way ANOVA: Years with the Company

Independent Variable	Dependent Variable	F	Sig.
Years with the Company	The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	3.60	.02
	The understanding of OE is not consistent among the workforce	3.21	.02
	I don't think that my current staff (direct reports) actively participate in OE	2.73	.05
	For the type of work that I perform, engagement with OE is meaningless	4.02	.01
	Training courses and meetings in OE expectations and execution are not of any interest to me	2.71	.05
	I think that the company is spending too much time and money on OE	3.43	.02

In terms of the independent variable “Highest level of educational attainment”, the null hypotheses that this variable has no effect at the $p \leq .05$ level on the following dependent variables can be rejected: “I do not understand the purpose of our firm’s corporate OE vision” (F=2.78; Sig.=.03); “I don’t think that my manager demonstrates the OE culture” (F=2.88; Sig.=.02); “For the type of work that I perform, engagement with OE is meaningless” (F=3.72; Sig.=.01); “Training courses and meetings in OE expectations and execution are not of any interest to me” (F=2.53; Sig.=.04); and “My current manager is very knowledgeable about OE” (F=3.16; Sig.=.02). These results are shown in Table 30.

Table 30

One-Way ANOVA: Highest Level of Educational Attainment

Independent Variable	Dependent Variable	F	Sig.
Highest level of educational attainment	I do not understand the purpose of our firm's corporate OE vision	2.78	.03
	I don't think that my manager demonstrates the OE culture	2.88	.02
	For the type of work that I perform, engagement with OE is meaningless	3.72	.01
	Training courses and meetings in OE expectations and execution are not of any interest to me	2.53	.04
	My current manager is very knowledgeable about OE	3.16	.02

For the independent variable "If college graduate, was field of study construction management or engineering", the null hypotheses that this variable has no effect at the $p \leq .05$ level on the following variables can be rejected: "For the type of work that I perform, engagement with OE is meaningless" (F=5.66; Sig.=.00) and "I believe that the company is committed to encouraging OE engagement on all levels within the company" (F=4.68; Sig.=.01). These results are shown in Table 31.

Table 31

One-Way ANOVA: Was Field of Study Construction Management or Engineering

Independent Variable	Dependent Variable	F	Sig.
If college graduate, did I study construction management and/or engineering?	For the type of work that I perform, engagement with OE is meaningless	5.66	.00
	I believe that the company is committed to encouraging OE engagement on all levels within the company	4.68	.01

In terms of the independent variable "My current organizational structure", the null hypotheses that this variable has no effect at the $p \leq .05$ level on the following dependent variables can be rejected: "I think that OE requirements get in the way of the work that needs to be done" (F=4.28; F=.02); "The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise" (F=3.13; Sig.=.05); "I don't think that my manager demonstrates the OE culture" (F=6.08; Sig.=.00); "The purpose of OE has never been fully explained to me" (F=3.20; Sig.=.04); "For the type of work that I perform, engagement with OE is meaningless" (F=3.71; Sig.=.03); "Training courses and meetings in OE expectations and execution are not of any benefit to me" (F=8.44; Sig.=.00); "Training courses and meetings in OE expectations and execution are not of any interest to me" (F=4.31; Sig.=.02); "My current manager does not actively emphasize OE expectations among the team" (F=5.65; Sig.=.00); "I think that the company is spending too much time and money on OE" (F=7.72; Sig.=.00); "Safety and efficiency are two of the five key components of OE; I can name the other three" (F=6.98; Sig.=.00); "I believe that my manager is committed to

developing direct reports who can work successfully within the OE expectations" (F=6.79; Sig.=.00); "I would like to participate in training and/or courses to develop a better understanding of OE" (F=9.65; Sig.=.00); and "My current manager has expressed his desire to increase OE participation among our team" (F=4.63; Sig.=.01). These results are shown in Table 32.

Table 32

One-Way ANOVA: My Current Organizational Structure

Independent Variable	Dependent Variable	F	Sig.
My current organizational structure	I think that OE requirements get in the way of the work that needs to be done	4.28	.02
	The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	3.13	.05
	I don't think that my manager demonstrates the OE culture	6.08	.00
	The purpose of OE has never been fully explained to me	3.20	.04
	For the type of work that I perform, engagement with OE is meaningless	3.71	.03
	Training courses and meetings in OE expectations and execution are not of any interest to me	4.31	.02
	My current manager does not actively emphasize OE expectations among the team	5.65	.00
	I think that the company is spending too much time and money on OE	7.72	.00
	Safety and efficiency are two of the five key components of OE. I can name the other three	6.98	.00
	I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	6.79	.00
	I would like to participate in training and/or courses to develop a better understanding of OE	9.65	.00
	My current manager has expressed his desire to increase OE participation among our team	4.63	.01

For the independent variable "OE Seminar Attendance", the null hypotheses that this variable has no effect at the $p \leq .05$ level on the following dependent variables can be

rejected: “I do not understand how OE relates to my current role in the company” (F=3.72; Sig.=.03); “I cannot name any of the key OE focus areas” (F=8.83; Sig.=.00); “The purpose of OE has never been fully explained to me” (F=7.99; Sig.=.00); “For the type of work that I perform, engagement with OE is meaningless” (F=3.63; Sig.=.03); “Safety and efficiency are two of the five key components of OE; I can name the other three” (F=10.81; Sig.=.00); “I understand the Tenets of Operation” (F=3.06; Sig.=.05); “I understand the OE responsibilities that are specific to my role within my company” (F=8.29; Sig.=.00); “My manager has actively contributed to providing me with a better understanding of OE” (F=4.96; Sig.=.01); “I am aware of opportunities to participate in OE” (F=19.80; Sig.=.00); “My current manager is very knowledgeable about OE” (F=3.85; Sig.=.02); “My current manager has expressed his desire to increase OE participation among our team” (F=9.38; Sig.=.00), and “I have participated in an OE-related training or workshop in the last year” (F=36.34; Sig.=.00). These findings are shown in Table 33.

Table 33

One-Way ANOVA: OE Seminar Attendance

Independent Variable	Dependent Variable	F	Sig.
Have I attended any type of seminar and/or courses in Operational Excellence (OE)?	I do not understand how OE relates to my current role in the company	3.72	.03
	I cannot name any of the key OE focus areas	8.83	.00
	The purpose of OE has never been fully explained to me	7.99	.00
	For the type of work that I perform, engagement with OE is meaningless	3.63	.03
	Safety and efficiency are two of the five key components of OE. I can name the other three	10.81	.00
	I understand the Tenets of Operation	3.06	.05
	I understand the OE responsibilities that are specific to my role within the company	8.29	.00
	My manager has actively contributed to providing me with a better understanding of OE	4.96	.01
	I am aware of opportunities to participate in OE	19.80	.00
	My current manager is very knowledgeable about OE	3.85	.02
	My current manager has expressed his desire to increase OE participation among our team	9.38	.00
	I have participated in an OE-related training or workshop in the past year	36.34	.00

Given the above results, it is clear that certain independent variables (i.e. OE seminar attendance, current organizational structure, years with the company, and business unit) have strong linear relationships (at the $p \leq .05$ level) with several of the dependent variables. However, geographic location, field of study, and primary work environment represent independent variables that have strong linear relationships (at a

$p \leq .05$ level) with a very small number of dependent variables. In the next section, the number of variables will be paired down to only focus on those that indicate significant linear relationships and to allow for testing of variances across the constructs of OE comprehension, OE engagement and leadership awareness.

F-Tests Across Constructs. In order to determine variances within the model across the three constructs of OE Comprehension, OE Engagement, and Leadership Awareness, a regression analysis was created within each construct. The first step included the identification of statistically significant relationships between the independent variables and the dependent variables within each construct. The next step involved an analysis with an average of all of these values, by construct, in order to determine the extent to which the construct as a whole can serve as a predictor at the $p \leq .05$ level of the noted dependent variables.

In Table 34, each of the independent variables is shown with the dependent variables of the OE Comprehension construct upon which a statistically significant effect was discovered. In terms of the independent variables, geographic location, highest level of educational attainment, and field of study did not have a statistically significant effect on any of the ten dependent variables that comprise this construct. Although it is certainly intuitive that the prior participation in an OE seminar would have an effect on the degree to which employees comprehend OE, it is interesting that this independent variable only had a statistically significant effect on five of the ten dependent variables within this construct.

Table 34

Statistically Significant Effects on OE Comprehension Construct

Independent Variable	Dependent Variable	R	R^2	t	F	Sig.
My role within the company	The understanding of OE is not consistent among the workforce	.14	.02	-2.06	4.23	.04
Business Unit	Safety and efficiency are two of the five key components of OE. I can name the other three	.20	.04	-2.82	7.97	.01
	I understand the OE responsibilities that are specific to my role within the company	.15	.02	-2.10	4.41	.04
Geographic Location						
Primary Work Environment	I understand the Tenets of Operation	.14	.02	-1.99	3.94	.05
Years with the Company	The understanding of OE is not consistent among the workforce	.19	.03	-2.66	7.07	.01
Highest level of educational attainment						
If college graduate, did I study construction management and/or engineering?						
My current organizational structure	Safety and efficiency are two of the five key components of OE. I can name the other three	.25	.06	-3.64	13.28	.00
Have I attended any type of seminar and/or courses in Operational Excellence (OE)?	I do not understand how OE relates to my current role in the company	.17	.03	-2.46	6.03	.02
	I cannot name any of the key OE focus areas	.21	.04	-3.05	9.29	.00
	The purpose of OE has never been fully explained to me	.23	.05	-3.35	11.23	.00
	Safety and efficiency are two of the five key components of OE. I can name the other three	.25	.06	3.55	12.60	.00
	I understand the OE responsibilities that are specific to my role within the company	.23	.05	3.24	10.51	.00

This indicates that the null hypotheses that suggests that these variables have no effect on these specific dependent variables can be rejected. Similarly, for the independent variables geographic location, highest level of educational attainment and field of study, the null hypotheses that tests whether these variables have no effect on these dependent variables *cannot* be rejected. Thus, these three independent variables were found not to be statistically significant predictors at the $p \leq .05$ level for these dependent variables in this model.

A linear regression was estimated for each of the nine independent variables and each of the ten dependent variables in this construct. For each of these linear regressions, the R value, R^2 value, F value, and confidence level were calculated. These values were summarized and averaged, and the values generated from these models are shown in Table 35. The results indicate that the independent variables (using averages of all values) are not statistically significant predictors ($p \leq .05$) of the OE comprehension construct, as a whole.

Table 35

OE Comprehension Construct: Average Values

	R	R^2	F	Sig.
Averages:	.25	.07	1.65	.29

In Table 36, each of the independent variables is shown with the dependent variables of the OE Engagement construct upon which a statistically significant effect was discovered. In terms of the independent variables, company role and highest level of educational attainment did not have a statistically significant effect on any of the ten dependent variables in this construct. Although it is certainly intuitive that employment

tenure and prior participation in an OE seminar would have an effect on the degree to which employees engage in OE activities, it is interesting that these independent variables only had statistically significant effects on two of the ten dependent variables within this construct.

Table 36

Statistically Significant Effects on OE Engagement Construct

Independent Variable	Dependent Variable	R	R^2	t	F	Sig.
My role within the company						
Business Unit	I am aware of opportunities to participate in OE	.16	.02	-2.21	4.86	.03
	I have participated in an OE-related training or workshop in the past year	.17	.03	-2.46	6.07	.02
Geographic Location	The company's leaders need to focus their attention on much more important issues than on developing OE expertise	.15	.02	-2.13	4.51	.04
Primary Work Environment	Training courses and meetings in OE expectations and execution are not of any interest to me	.16	.03	2.36	5.57	.02
Years with the Company	The company's leaders need to focus their attention on much more important issues than on developing OE expertise	.20	.04	-2.94	8.62	.00
	I believe that my co-workers are interested in participating in OE-type activities	.16	.03	2.28	5.19	.02
Highest level of educational attainment						
If college graduate, did I study construction management and/or engineering?	For the type of work that I perform, engagement with OE is meaningless	.19	.04	-2.72	7.38	.01
	I believe that the company is committed to encouraging OE engagement on all levels within the company	.20	.04	2.94	8.64	.00
My current organizational structure	Safety and efficiency are two of the five key components of OE. I can name the other three					
Have I attended any type of seminar and/or courses in Operational Excellence (OE)?	I am aware of opportunities to participate in OE	.31	.10	4.55	20.68	.00
	I have participated in an OE-related training or workshop in the past year	.35	.12	5.24	27.48	.00

This indicates that the null hypotheses that these noted independent variables have no effect on these specific dependent variables can be rejected. Similarly, for the independent variables company role and highest level of educational attainment, the null hypotheses that these independent variables have no effect on these dependent variables *cannot* be rejected. Thus, these two independent variables were found not to be statistically significant predictors at the $p \leq .05$ level for these dependent variables in this model.

A linear regression was estimated for each of the nine independent variables and each of the ten dependent variables in this construct. For each of these linear regressions, the R-value, R^2 value, F value, and confidence level were calculated. These values were summarized and averaged, and the values generated from these models are shown in Table 37. The results indicate that the independent variables (using averages of all values) are not statistically significant predictors ($p \leq .05$) of the OE engagement construct, as a whole.

Table 37

OE Engagement Construct: Average Values

	R	R^2	F	Sig.
Averages:	.29	.09	2.00	.14

In Table 38, each of the independent variables is shown with the dependent variables of the OE Leadership Awareness construct upon which a statistically significant effect was discovered. In terms of the independent variables, geographic location, primary work environment, and field of study did not have a statistically significant effect

on any of the ten dependent variables in this construct. In this construct, it is also interesting that the business unit variable had statistically significant effects on the most (three, same as the expected prior participation in an OE seminar variable) of the ten dependent variables within this construct.

Table 38

Statistically Significant Effects on OE Leadership Construct

Independent Variable	Dependent Variable	R	R^2	T	F	Sig.
My role within the company	I don't think that my current staff (direct reports) actively participate in OE	.37	.13	-5.53	30.54	.00
Business Unit	My current manager does not actively emphasize OE expectations among the team	.19	.04	2.68	7.18	.01
	I believe that my manager is committed to developing direct reports who can work successfully within OE expectations	.15	.02	-2.15	4.61	.03
	My current manager is very knowledgeable about OE	.19	.04	-2.77	7.69	.01
Geographic Location						
Primary Work Environment						
Years with the Company	I think that the company is spending too much time and money on OE	.20	.04	-2.81	7.91	.01
Highest level of educational attainment	I don't think that my current staff (direct reports) actively participate in OE	.16	.02	2.22	4.92	.03
If college graduate, did I study construction management and/or engineering?						
My current organizational structure	My current manager has expressed his desire to increase OE participation among the team	.17	.03	-2.42	5.86	.02
Have I attended any type of seminar and/or courses in Operational Excellence (OE)?	My manager has actively contributed to providing me with a better understanding of OE	.19	.04	2.73	7.43	.01
	My current manager is very knowledgeable about OE	.15	.02	2.12	4.48	.04
	My current manager has expressed his desire to increase OE participation among the team	.16	.03	2.30	5.28	.02

This indicates that the null hypotheses that these noted independent variables have no effect on these specific dependent variables can be rejected. Similarly, for the independent variables geographic location, primary work environment, and field of study, the null hypotheses that these independent variables have no effect on these dependent variables *cannot* be rejected. Thus, these three independent variables were found not to be statistically significant predictors at the $p \leq .05$ level for these dependent variables in this model.

A linear regression was estimated for each of the nine independent variables and each of the ten dependent variables in this construct. For each of these linear regressions, the R-value, R^2 value, F value, and confidence level were calculated. These values were summarized and averaged, and the values generated from these models are shown in Table 39. The results indicate that the independent variables (using averages of all values) are not statistically significant predictors ($p \leq .05$) of the OE leadership awareness construct, as a whole.

Table 39

OE Leadership Awareness Construct: Average Values

	R	R^2	F	Sig.
Averages:	.26	.07	1.72	.25

Discussion

In the analysis on correlation coefficients, the "largest" coefficient discovered was .37 between the independent variable: "my role within the company" and the dependent variable: "I don't think that my current staff (direct reports) actively participate in OE."

This coefficient is considered to be, however, only of "medium strength" and was one of thirty correlation coefficients (Appendix F) that found to be statistically significant at the $p \leq .05$ level.

It was certainly intuitive that the independent variable "Have I attended any type of seminar and/or courses in OE" would be the variable with the most statistically significant coefficients (ten) in the study, but other results were less expected. "My role within the company" (two), "years with the company" (three), and "highest level of educational attainment" (one) were expected to have a greater number of such coefficients given the hypothesis that seniority, tenure, and education would likely indicate a greater amount of OE awareness and comprehension. Another surprising discovery was that the "business unit" variable had the second-most statistically significant coefficients (seven) in the study, given that OE training is offered and administered equally across all business units. Although each business unit was not comparative in terms of sample size, the findings related to the Public Sector unit (the largest unit in the division) are of particular interest.

The correlation coefficient analysis also provided a few other insights of note. In terms of employment tenure, it was interesting that employees with shorter tenures are more likely to disagree that the company's leaders need to focus their attention on matters other than OE. This would seem to indicate that newer employees appear to embrace OE more than longer-tenured employees. In terms of the business unit variable, the data indicated that employees in the Public Sector are more likely to agree that OE expectations are not emphasized by current management and also are less likely to have

participated (compared to other business units) in OE-related training during the past year.

In the t-testing phase of this study, linear regression models were used to determine if the independent variables had a non-zero effect (at the $p \leq .05$ level) on the thirty dependent variables. The independent variable "have I attended any type of seminar and/or courses in OE" intuitively showed the largest number of non-zero effects (ten) on the dependent variables, but it seems odd that this independent variable did not have a non-zero effect on most (if not all) of the dependent variables. Again, employment tenure, seniority, and prior OE participation were expected to be the independent variables with the most significant effect on the dependent variables, but the overall impact was less than anticipated. In addition, independent variables such as geographic location and highest level of educational attainment each only showed one non-zero effect on the thirty dependent variables.

In the F-testing phase, the independent variables "have I attended any type of seminar and/or courses in OE" (twelve) and "business unit" (six) remained among the variables with the greatest number of statistically significant non-zero effects on the dependent variables, but other variables emerged as well. The data indicated that "my current organizational structure" (twelve), "years with the company" (six), and "highest level of educational attainment" (five) also showed non-zero effects on several of the dependent variables. Among the dependent variables, the analysis indicated that no more than three independent variables showed a statistically significant non-zero effect on any one dependent variable. As an example, "my role within the company", "business unit", and "years with the company" were the only independent variables that were found to

have a non-zero effect on the dependent variable “the understanding of OE is not consistent among the workforce.”

In terms of the OE comprehension construct, linear regressions were generated for all variables to calculate R, R^2, t and F values. In Tables 28, 30, and 32 all of the values shown are statistically significant at the $p \leq .05$ level. In addition, Tables 29, 31, and 33 show the average R, R^2, t and F values for all of the linear regression models that were generated for each construct. Given the relatively small number of statistically significant effects (as discussed in the correlation coefficient, t-testing and F-testing discussions), it was hardly surprising that these independent variables were found not to be statistically significant predictors of these constructs.

In the next chapter, further discussion of the research analysis and findings will be included as well as additional discussion on the limitations and strengths of this study. Conclusions will also be presented, which will include opportunities for future research and supplemental qualitative analysis.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

The primary objective of this analysis was to achieve a better understanding of employee perceptions toward a corporate-wide initiative that is extremely important to the company's culture. As discussed in Chapter 2, Gourdner's (1957) sociological theories assert that individuals look outside themselves for norms of behavior and role definition. An organization that is able to successfully integrate and align both processes and values among the workforce will create a foundation from which to implement collective objectives such as operational excellence.

The study examined whether a variety of demographic variables have linear relationships with, and thus can predict, the effect on a number of dependent variables (individually or as a construct) concerned with comprehension, engagement and leadership awareness with respect to Operational Excellence. The sample population included all 300 employees within the subject division, of which 204 employees responded to the survey. Data were collected using survey research methods and analyzed through quantitative analysis. In the first part of this chapter, the strengths and limitations related to this research process are discussed. The next two sections include a discussion of the research findings and suggestions for future research opportunities. The chapter concludes with a discussion of the completed study and perspectives gleaned with respect to employees' perceptions of Operational Excellence.

Strengths and Limitations

A discussion on the strengths and limitations of this study be useful for future researchers and/or studies that will examine this concept from a variety of perspectives.

This section will focus on strengths and limitations with respect to the collection and analysis of the data.

Strengths

In terms of strengths, this study involved the full support of executive management in both the Human Resources and Operational Excellence departments. There is little doubt that the reminders and the link to the survey sent to all employees from the OE manager was a significant factor in obtaining the survey response rate. The communication to the employees (through the Consent Form) that all responses would be confidential, and that the primary objective was to obtain honest feedback with respect to OE, also contributed to increasing respondent participation.

Importantly, the survey instrument and corresponding questions were designed with the assistance of multiple company executives from the OE, HR and legal departments. The final wording and structure of these thirty questions resulted from a lengthy and tedious process with multiple work sessions. Ultimately, the final survey work product captured the synthesized thoughts and insights from this team of individuals, with the shared objective of completing an initial phase of a multi-phased and multi-faceted research study.

The nine independent variables used in the analysis included demographic information such as employee role, business unit, geographic location, primary work environment, educational background, field of study, current organizational structure, and past OE participation. Taken together, the intention was to identify the extent to which OE comprehension and engagement differed among individuals with different backgrounds and work experiences. An online survey instrument proved to be an easy,

non-intrusive, and inexpensive method through which to reach all 300 employees and obtain these responses.

Limitations

In terms of limitations, there were several that influenced the results of this study. The first such limitation was the disparate number of potential respondents among the independent variables. In a division of 300 employees, the vast majority are "individual contributors" rather than supervisors, managers, or senior managers. Of the 204 respondents for this specific independent variable, 150 (or 73.5%) were individual contributors while nine were supervisors, 40 were managers, and only five were senior managers. Similarly, other independent variables such as Business Unit, Geographic Location, and Primary Work Environment were heavily skewed toward the Public Sector (73.0% of respondents), West (65.2%), and Office (82.8%), respectively. This clearly limits the generalizability of the results, but future studies could be undertaken within each of those business units, locations, or work environment to address this issue.

Another important limitation was that demographic information such as gender, race/ethnicity, and age were not included in this study. Unfortunately, this was a decision made by the survey development team for a variety of reasons and was not an option. As such, this prevented an examination of any differences that might have been uncovered on OE comprehension, engagement or leadership awareness in terms of these variables.

The period of measurement was also a potential limitation in that the survey could have been administered to employees at a time just before or after OE training and workshops. In other words, employees might have responded much differently to many of the questions on comprehension and engagement depending on the time of year in which the survey was received. In addition to opening the possibility of multiple

interpretations (depending on time frame), it would also be difficult to compare the results of this study to future studies due to the same limitation.

A significant limitation exists in that this study did not involve an established and validated survey instrument. Although experienced managers within the company essentially created the survey questions, the framework of the study cannot point to existing similar studies or instruments. In the research process, a variety of instruments were examined relating to change management, process management, organizational culture and organizational climate, but none of these captured the specific objectives of this study and were thus unable to be utilized as validated instruments.

Discussion of Research Findings

In this section, a discussion of the research findings related to employee comprehension, engagement, and leadership awareness with respect to OE will be presented. The first section includes a discussion of the linear relationships discovered between the variables and the effects of the independent variables on the model's dependent variables. The second section focuses on model predictability and a discussion of variances across variables and constructs.

Linear Relationships Between Variables

In terms of the analysis of linear relationships between variables, only small (.10 to .30) and medium (.31 to .50) correlation coefficients were discovered in this study. Although some of these linear relationships were highly intuitive (e.g. an employee who has attended an OE seminar is more likely to be aware of opportunities to participate in OE), a few were worthy of additional attention. In Model 6 (Table 10), the regression at the $p \leq .05$ level suggests that employees who have a shorter tenure are more likely to disagree with the assertion that the understanding of OE is not consistent among the

workforce. Similarly, this suggests that senior management is *more likely* to agree that OE comprehension varies across the employee population. This could be attributed to the effectiveness of different training programs, commitments to OE on the part of direct supervisors, or the different levels of exposure to OE to which employees are subjected. This type of acknowledged inconsistency of OE comprehension is precisely the type of discovery that HR and OE management were interested in identifying.

The use of dummy variables for the Business Unit independent variable provided insights into the different effects on the independent variables. In Model 8 (Table 12), the regression at the $p \leq .05$ level suggests that employees who work in the Public Sector and Renewable Power business units have a statistically significant association with the assertion that current management does not actively emphasize OE expectations, while the CVX support business unit does not. In addition, it is interesting that the Public Sector has a negative estimated coefficient while the Renewable Power has a positive estimated coefficient, indicating that Public Sector employees are more likely to agree with this assertion while Renewable Power employees are more likely to disagree. This type of discovery could serve as the precursor to subsequent studies that focus specifically on the Public Sector business unit (i.e. individual OE training for these employees) but also on the existing management structure (i.e. OE training, communication style, etc.) within this unit. These follow-up studies could then guide the structure of corrective action, which could come in the form of management development programs, additional training, performance evaluation integration, or targeted corporate communication.

For each of the significant correlation coefficients, t-tests were conducted at the $p \leq .05$ level to determine whether the variable in question had a non-zero effect on the model's dependent variable. The results of these tests indicated that prior attendance of OE courses and seminars, employees who studied engineering or construction management, and a longer company tenure do indeed have an effect on OE comprehension and engagement. This type of discovery could lead HR and OE management to perform follow-up studies specifically involving newer employees and non-engineering/construction management majors to understand where gaps might exist in OE comprehension and engagement.

Model Predictability and Variances

In this study, F-tests were used to determine whether the model's independent variables serve as significant predictors (at the $p \leq .05$ level) of specific dependent variables. In addition to prior attendance of OE courses and seminars, employees who studied engineering or construction management, and a longer company tenure (as described in the previous section), F-tests indicated that current organizational structure and business unit also have a non-zero effect on the model's dependent variables.

Of the ten questions that comprise the OE comprehension construct, F-tests revealed that the independent variables served as statistically significant predictors at the $p \leq .05$ level for only three of these dependent variables: "The understanding of OE is not consistent among the workforce", "Safety and efficiency are two of the five key OE components; I can name the other three" and "I understand the OE responsibilities that are specific to my role within the company." The independent variables were found not to be a statistically significant predictor of this construct itself, as a whole. This may certainly be more a product of the survey questions themselves (and/or the method by

which they were presented to the employees) rather than a simple non-zero effect on such a construct.

Of the ten questions that comprise the OE engagement construct, F-tests determined that the independent variables served as statistically significant predictors at the $p \leq .05$ level for only four of these dependent variables: "For the type of work that I perform, engagement with OE is meaningless", "Training courses and meetings in OE expectations and execution are not of any interest to me", "I am aware of opportunities to participate in OE", and "I have participated in an OE-related training or workshop in the past year." The independent variables were found not to be statistically significant predictors of this construct itself, as a whole. As asserted above, this result may certainly be more a product of the survey questions themselves (and/or the method by which they were presented to the employees) rather than a simple non-zero effect on such a construct. This issue could be probed more deeply and specifically with a qualitative component (as a follow-up to the four dependent variables upon which the independent variables were found to have a non-zero effect) as well as a re-structured survey instrument that would potentially replace both independent and dependent variables that may not have been the most suitable.

Of the ten questions that comprise the OE leadership awareness construct, F-tests determined that the independent variables served as statistically significant predictors at the $p \leq .05$ level for only two of these dependent variables: "I don't think that my current staff actively participates in OE" and "My current manager does not actively emphasize OE expectations among the team." The independent variables were found not to be statistically significant predictors of this construct itself, as a whole. As asserted above,

this result may certainly be more a product of the survey questions themselves (and/or the method by which they were presented to the employees) rather than a simple non-zero effect on such a construct. This issue could be probed more deeply and specifically with a qualitative component (as a follow-up to the two dependent variables upon which the independent variables were found to have a non-zero effect), particularly since an accurate understanding of management's role in the modeling, transmission and implementation of OE is so critically important to the company.

Summary of Research Findings

In Chapter 2, the review of the literature began with the concept of change management since operational excellence is largely a transformative process that involves a change in organizational culture, employee commitment, an alignment of values, and leadership that is committed to managing the process and ensuring that the vision is clearly communicated, continuously monitored, and adjusted as necessary.

The discussion of operational excellence – in a general sense – involved process mapping and process management centered on the concept of *integration* in terms of individual actions as part of a larger system. In order to be successful (given the highly competitive landscapes in which most firms exist), organizations need to be purposeful, cost-effective and efficient. However, "when attempting to implement their business strategies, they give employees only limited descriptions of what should do and why those tasks are important" (Kaplan and Norton, 2001, p. 51). The successful implementation of operational excellence within the subject organization depends largely on the extent to which executives and managers clearly communicate and *model* this message.

The discussion of organizational culture and climate is particularly critical given the process of "collective programming" that needs to occur. The social environment in which employees exist and work can shape and guide their actions, but only if these employees clearly understand and believe in the value system that the social environment is seeking to create. As Schein (2004) posited, "To function as a group, the individuals who come together must establish a system of communication and a language that permits interpretation of what is going on…Categories of meaning that organize perceptions and thought filter out what is unimportant while focusing on what is important" (p. 111). How can individuals correctly interpret and ultimately embody operational excellence if they do not truly understand what it is?

The ethical component of this discussion is also relevant given that ethical climates ultimately shape "intra-organizational relationships and employee attitudes, thereby also having considerable impact on the organizational (e.g. financial performance) outcomes" (Elçi and Alpkan, 2009, p. 297). In other words, a perceived ethical work environment is positively associated with employee commitment and satisfaction, which consequently promotes behaviors that are in the best interests of the organization. This dynamic essentially becomes a form of social exchange theory, a reciprocity (climate and commitment) between the organization and the employee (Choi, Tran and Park, 2015).

The role of management is a central component of this discussion since leaders develop, guide, reinforce and model the values-based climate of an organization. If management is encouraging the workforce to adopt and implement operational excellence across all work activities and behaviors, the ultimate effectiveness of this message will

largely depend not only on the communication but also on the extent to which the managers model these behaviors in their own words and actions. The concepts of process management, organizational culture and climate, values-based systems, and current leadership were all embedded within the survey instrument for this study, with the objective to uncover areas of disconnection and thus opportunity.

Overall, the findings of this study indicated several expected outcomes. First, individuals who have already participated in some form of OE-related training will be more likely to have an awareness of and an interest in participating in OE activities. Second, respondents who held a more senior role within the company clearly indicated increased comprehension of and engagement in OE-related activities as well as a more favorable perspective on OE awareness among existing leadership.

In terms of unexpected outcomes, business unit and field of study (engineering or construction management) were found to be statistically significant predictors of several of the model's dependent variables. Since the vast majority of the division's employees are in the Public Sector business unit, it is interesting that individuals from this unit were less likely to respond favorably that current management actively emphasizes OE expectations. This apparent gap between what the company is seeking from management and what respondents are perceiving in the public sector should be explored further as part of a qualitative analysis. The study also suggested that employees who studied engineering or construction management (comprising 48.5% of all respondents) were more likely to respond that OE is meaningful for the type of work that these individuals perform. Although this finding could be attributed to these employees having job descriptions that are more closely aligned with OE in both practice and concept, this

could also be explored further through qualitative methods. Another unexpected outcome was that employment tenure was not a significant predictor of OE comprehension and engagement. This finding would seem to indicate that employees with longer tenures with the company did not differ from shorter-tenured employees in this regard. Additionally, none of the data indicated that primary work environment, highest level of educational attainment, current organizational structure or geographic location were statistically significant predictors (at the $p \leq .05$ level) of the model's dependent variables.

The discovery that the mean response was 3.24 (Appendix F) to the survey question "the understanding of OE is not consistent among the workforce" is noteworthy given that this indicates that the response "I neither agree nor disagree" was the average response to this question. Although the average response was expected to be near "1" ("strongly agree") for questions such as "Safety and efficiency are two of the five key components of OE; I can name the other three", "I am aware of opportunities to participate in OE", and "I have participated in an OE-related training or workshop in the past year", the average responses to these questions were greater than "2" ("slightly agree"). The apparent lack of conviction in these responses (and in several others) may suggest uncertainty with respect to these specific questions and thus to the concept of operational excellence within the organization.

Future Research Opportunities

The comprehension of operational excellence is a difficult concept to study and measure given that it means different things for different people and organizations. It is particularly challenging to define in a global, multi-national energy company since the work activities of employees involve (to name several primary groups) administration,

business development, structured finance, engineering, accounting, legal, human resources, safety, training, project management, construction, and senior management. A concerted effort by the company to define Operational Excellence, in the context of each employee's role and work activities, would be extremely valuable and would thus improve the likelihood that each individual will be able to accurately assess the extent to which comprehension, engagement, and leadership awareness exist. As per Lu, Betts & Croom (2011), "…there are so many different forms and shapes of business excellence models and…it is almost impossible to have a strictly uniformed and universally agreeable framework for all situations and contexts (p. 1266).

Future research should consider a qualitative component, which was not an option in this particular study due to the researcher's status as an employee. Since individuals perceive and process the same concepts differently based on their own personal development and life experiences, a qualitative component would provide a more fulsome compilation of individual interpretations and perspectives. Responses to qualitative inquiry could also provide important feedback concerning the survey instrument itself, which would result in questions (thus dependent variables) that are more suitable and would thus provide data that is more precise, relevant, and impactful.

Finally, future studies could analyze the methods by which OE comprehension and engagement are tracked as part of an employee's performance. In other words, although current employee performance evaluations may contain metrics associated with the display of OE behaviors, a more comprehensive study of the extent to which individuals implement OE principles in practice would capture the relationship between comprehension and implementation on individual levels. This would not only ensure that

individual employees understand how OE principles relate to their current work activities, but it would also provide a mechanism through which the organization can evaluate and assess employee performance specifically with respect to OE.

Conclusions

As a division of 300 employees within a Fortune 500 energy corporation comprised of more than 60,000 employees worldwide, the individuals within the division represent a small, but meaningful, perspective on the company-wide OE implementation initiative. As discussed in the previous section, subsequent studies will allow for a more targeted approach and qualitative inquiries can provide valuable perspective and context that will enhance the findings that this study has been able to provide.

As per Kaplan and Norton (2000), "The key to executing your strategy is to have people in your organization understand it – including the crucial but perplexing process by which intangible assets will be converted into tangible outcomes" (p. 51). Clearly, the extent to which an organization is able to successfully implement a corporate initiative (such as OE) largely depends on the degree to which the organization is able to ensure employee comprehension and alignment. This study is essentially the first phase in a much larger and more comprehensive process, given that the objective has been to identify (by way of a survey instrument and quantitative analysis) potential gaps or disconnects between the OE message that the company is trying to send and the one that is being received by this sample of division employees.

The achievement of operational excellence is not only dependent upon the formation and implementation of key processes, but also requires the seamless integration and *internalization* of these concepts by the workforce in order to create a committed and

sustained culture within the organization. Operational excellence ultimately becomes the product of a shared set of values that define the organization not only by what it does, but also by what it *is*.

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APPENDICES

Appendix A: Survey Demographical Questions

APPENDIX A

Exit this survey

CES Operational Excellence Survey - January 2014 - Ruben

1 * My role within the company:
- Individual Contributor
- Supervisor (have Managers reporting to you)
- Manager (have Individual Contributor(s) reporting to you)
- Senior Management

2 * Business Unit:
- Public Sector
- Federal Business Unit
- CVX Support Business Unit
- Renewable Power

3 * Geographic Location:
- West (California, Arizona, Nevada, Hawaii)
- Mountain (Colorado, Utah)
- Midwest (Kansas, Michigan, Minnesota, Illinois, Ohio)
- South (Texas, Tennessee, Florida, Georgia)
- East (Maryland, New Jersey, Pennsylvania)

4 * Primary work environment:
- Office
- Field (i.e., on construction site)

5 * Years with the company:
- 5 or less
- 6-10
- 11-20
- More than 20

6 * Highest level of educational attainment:
- None

- 2 year degree
- 4 year college degree
- Graduate degree
- Doctoral degree

7 * If college graduate, did you study construction management and/or engineering?

- Yes
- No
- N/A

8 * How would you describe your current organizational structure:

- Horizontal, collaborative
- Vertical, hierarchical
- Combination of collaborative/hierarchical

9 * Have I attended any type of seminar and/or courses in Operational Excellence (OE)?

- Yes
- No
- I'm not sure

Next

APPENDIX B

Exit this survey

Chevron

CES Operational Excellence Survey - January 2014 - Ruben

10 * In this section, please indicate the extent to which you agree or disagree with the following statements using the following scale (where 1=strongly agree and 5=strongly disagree):

	Strongly Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Strongly Disagree	Not Applicable
I don't understand how OE relates to my current role in the company.						
I think that OE requirements "get in the way" of the work that needs to be done.						
I cannot name any of the key OE focus areas.						
The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise.						
I don't understand the purpose of our						

Appendix B: Survey Questions

	Strongly Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Strongly Disagree	Not Applicable
company's corporate OE vision.						
I don't think that my manager demonstrates the OE culture.						
The understanding of OE is not consistent among the workforce.						
I don't think that my current staff (direct reports) actively participate in OE.						
The purpose of OE has never been fully explained to me.						
My work group's current organizational structure does not lend itself to effective OE implementation.						
For the type of work that I perform, engagement with OE is meaningless.						
Training courses and meetings in OE expectations and execution would not be of any benefit to me.						

	Strongly Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Strongly Disagree	Not Applicable
Training courses and meetings in OE expectations and execution are not of any interest to me.	○	○	○	○	○	○
My current manager does not actively emphasize OE expectations among the team.	○	○	○	○	○	○
I think that the company is spending too much time and money in OE.	○	○	○	○	○	○

Prev Next

Exit this survey

Chevron

CES Operational Excellence Survey - January 2014 - Ruben

11 * In this section, please indicate the extent to which you agree or disagree with the following statements using the following scale (where 1=strongly agree and 5=strongly disagree):

	Strongly Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Strongly Disagree	Not Applicable
Safety and efficiency are two of the five key components of OE. I can name the other three.						
I understand the Tenets of Operation.						
I believe that my co-workers understand the Tenets of Operation.						
I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations.						
I would like to participate in training and/or courses						

	Strongly Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Strongly Disagree	Not Applicable
to develop a better understanding of OE.						
I understand the company's corporate vision for Operational Excellence.						
I understand the OE responsibilities that are specific to my role within the company.						
My manager has actively contributed to providing me with a better understanding of OE.						
I believe that the company is committed to encouraging OE engagement on all levels within the company.						
I believe that my co-workers are interested in participating in OE-type activities						
I think that the current management structure in which I work is fully committed to OE.						

	Strongly Agree	Slightly Agree	Neither Agree nor Disagree	Slightly Disagree	Strongly Disagree	Not Applicable
I am aware of opportunities to participate in OE.	○	○	○	○	○	○
My current manager is very knowledgeable about OE.	○	○	○	○	○	○
My current manager has expressed his desire to increase OE participation among our team.	○	○	○	○	○	○
I have participated in an OE-related training or workshop in the last year.	○	○	○	○	○	○

Prev Done

Appendix C: Survey Invitation to Employees from OE Manager

Fontes, Ruben

Subject: CES OE Survey

From: Weiss, Doug (DWEISS)
Sent: Thursday, January 09, 2014 7:46 AM
To: Fontes, Ruben; Wong, Carolyn J (CWONG)
Subject: CES OE Survey

Greetings and Happy 2014.

We are all familiar with the 2 Guiding Principles of the Operational Excellence (OE) Tenets of Operation, which are:

1. Do it safely or not at all
2. There is always time to do it right

In addition, we recognize that OE is a critical driver for business success and a key part of our enterprise strategy. The degree to which we align our Operational Excellence vision to our corporate vision depends on our individual commitments to our roles and responsibilities within the company.

In order to better understand and assess OE awareness and comprehension, please take a few moments to complete the following brief survey. The survey should not take longer than 10 minutes to complete, **an individual's response will be confidential and not be shared with others**, and will provide useful insight as we continue to disseminate and implement OE principles throughout CES.

The survey will be open for 2 weeks, and I hope that every CES Employee and Contractor will take a few minutes and participate in the survey. It is appreciated.

https://www.surveymonkey.com/s/5YTJN6Q

Douglas W. Weiss, P.E.
OE Manager

Chevron Energy Solutions Company
A division of Chevron U.S.A. Inc.
345 California Street, Suite 1815
San Francisco, CA 94104
415-733-4618

Appendix D: Study Participant Consent Form

Study Participant Consent Form

For the study entitled:
OE Awareness and Comprehension in CES

I. Purpose of the study
You are invited to participate in a study intended to better understand our level of awareness and comprehension of Operational Excellence (OE) principles within CES.

II. What you will be asked to do
If you decide to be in this study, you will be asked to:

Complete this brief online survey.
Your participation in this study will take a total of 10 minutes.

III. Foreseeable risks or discomforts

This study involves no more risk than the risks you encounter in daily life.

IV. Benefits
While there may be no direct benefit to you from participating in this study, the indirect benefit of participating will be knowing that you helped the study team better understand areas of opportunity for dissemination and reinforcement of OE principles within our business unit.

V. Confidentiality
Any information provided and/or identifying records will remain confidential and kept in a locked file and/or password-protected computer file in the researcher's office for a minimum of five years. All data collected from you will be coded with a number or pseudonym (fake name). Your real name will not be used. The results of this research project may be made public and information quoted in professional journals and meetings, but information from this study will only be reported as a group, and not individually.

VI. Compensation

You will receive no compensation for your participation in the study.

VII. Voluntary Nature of this Research
Participation in this study is entirely voluntary. You do not have to do this, and you can refuse to answer any question or quit at any time. Deciding not to participate or not answering any of the questions will have no effect on any benefits you're entitled to, like your employment. **You can withdraw from this study at any time without penalty.**

VIII. Contact Information
If you have any questions about this research, you may contact:

Doug Weiss, P.E.
Email: dweiss@chevron.com
Phone: (415) 733-4618

I have read and understand this form, and consent to the study it describes to me. I have received a copy of this consent form for my records.

To ENTER the survey, click here:

To EXIT the survey, click here:

Appendix E: Descriptive Statistics for Independent and Dependent Variables

Descriptive Statistics for Independent and Dependent Variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation
My role within the company	204	1.00	4.00	1.51	.89
Business Unit	204	1.00	4.00	1.68	1.15
Geographic Location	204	1.00	5.00	1.76	1.15
Primary Work Environment	204	1.00	2.00	1.17	.38
Years with the company	204	1.00	4.00	2.09	.97
Highest level of educational attainment	204	1.00	5.00	2.95	1.01
If college graduate, did I study construction management and/or engineering?	204	1.00	3.00	1.68	.74
My current organizational structure	204	1.00	3.00	2.44	.81
Have I attended any type of seminar and/or courses in Operational Excellence (OE)	204	1.00	3.00	1.54	.72
I do not understand how OE relates to my current role in the company	204	1.00	5.00	4.36	1.29
I think that OE requirements get in the way of the work that needs to be done	202	1.00	5.00	4.40	1.03
I cannot name any of the key OE focus areas	202	1.00	5.00	4.37	1.06
The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	203	1.00	5.00	4.19	1.05
I do not understand the purpose of our firm's corporate OE vision	202	1.00	5.00	4.63	.83
I don't think that my manager demonstrates the OE culture	203	1.00	6.00	4.54	.95
The understanding of OE is not consistent among the workforce	202	1.00	6.00	3.24	1.34
I don't think that my current staff (direct reports) actively participate in OE	201	1.00	6.00	5.04	1.16

The purpose of OE has never been fully explained to me	200	1.00	5.00	4.51	.96
My work group's current organizational structure does not lend itself to effective OE implementation	201	1.00	6.00	4.48	.95
For the type of work that I perform, engagement with OE is meaningless	203	1.00	6.00	4.70	.75
Training courses and meetings in OE expectations and execution are not of any benefit to me	197	1.00	5.00	4.49	.81
Training courses and meetings in OE expectations and execution are not of any interest to me	203	1.00	6.00	4.51	.85
My current manager does not actively emphasize OE expectations among the team	203	1.00	6.00	4.53	.89
I think that the company is spending too much time and money on OE	203	1.00	6.00	4.23	1.01
Safety and efficiency are two of the five key components of OE. I can name the other three.	200	1.00	5.00	2.39	1.38
I understand the Tenets of Operation	202	1.00	6.00	1.45	.84
I believe that my co-workers understand the Tenets of Operation	198	1.00	6.00	1.80	.98
I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	202	1.00	6.00	1.51	.88
I would like to participate in training and/or courses to develop a better understanding of OE	202	1.00	6.00	1.92	1.06
I understand the firm's corporate vision for Operational Excellence	201	1.00	5.00	1.52	.81
I understand the OE responsibilities that are specific to my role within the company	200	1.00	4.00	1.51	.79

My manager has actively contributed to providing me with a better understanding of OE	201	1.00	6.00	1.93	1.03
I believe that the company is committed to encouraging OE engagement on all levels within the company	200	1.00	4.00	1.44	.75
I believe that my co-workers are interested in participating in OE-type activities	202	1.00	6.00	2.15	1.04
I think that the current management structure in which I work is fully committed to OE	202	1.00	6.00	1.70	.98
I am aware of opportunities to participate in OE	200	1.00	6.00	2.18	1.18
My current manager is very knowledgeable about OE	199	1.00	6.00	1.77	.98
My current manager has expressed his desire to increase OE participation among our team	201	1.00	6.00	2.08	1.08
I have participated in an OE-related training or workshop in the last year	202	1.00	6.00	2.33	1.49

Appendix F: Means of Responses for Dependent Variables

Means of Responses for Dependent Variables

Dependent Variables	Statistics	Mean Responses
I do not understand how OE relates to my current role in the company	Mean	4.36
	N	204
	Std. Deviation	1.29
I think that OE requirements get in the way of the work that needs to be done	Mean	4.40
	N	202
	Std. Deviation	1.03
I cannot name any of the key OE focus areas	Mean	4.37
	N	202.0
	Std. Deviation	1.06
The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	Mean	4.19
	N	203
	Std. Deviation	1.05
I do not understand the purpose of our firm's corporate OE vision	Mean	4.63
	N	202
	Std. Deviation	.83
I don't think that my manager demonstrates the OE culture	Mean	4.54
	N	203
	Std. Deviation	.95
The understanding of OE is not consistent among the workforce	Mean	3.24
	N	202
	Std. Deviation	1.34
I don't think that my current staff (direct reports) actively participate in OE	Mean	5.04
	N	201
	Std. Deviation	1.16
The purpose of OE has never been fully explained to me	Mean	4.51
	N	200
	Std. Deviation	.96
My work group's current organizational structure does not lend itself to effective OE implementation	Mean	4.48
	N	201
	Std. Deviation	.95
For the type of work that I perform, engagement with OE is meaningless	Mean	4.70
	N	203
	Std. Deviation	.75
Training courses and meetings in OE expectations and execution are not of any benefit to me	Mean	4.49
	N	197
	Std. Deviation	.81
Training courses and meetings in OE expectations and execution are not of any interest to me	Mean	4.51
	N	203
	Std. Deviation	.85
My current manager does not actively emphasize OE expectations among the team	Mean	4.53
	N	203
	Std. Deviation	.89
I think that the company is spending too much time and money on OE	Mean	4.23
	N	203
	Std. Deviation	1.01

Safety and efficiency are two of the five key components of OE. I can name the other three.	Mean	2.39
	N	200
	Std. Deviation	1.38
I understand the Tenets of Operation	Mean	1.45
	N	202
	Std. Deviation	.84
I believe that my co-workers understand the Tenets of Operation	Mean	1.80
	N	198
	Std. Deviation	.98
I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	Mean	1.51
	N	202
	Std. Deviation	.88
I would like to participate in training and/or courses to develop a better understanding of OE	Mean	1.93
	N	202
	Std. Deviation	1.06
I understand the firm's corporate vision for Operational Excellence	Mean	1.52
	N	201
	Std. Deviation	.81
I understand the OE responsibilities that are specific to my role within the company	Mean	1.51
	N	200
	Std. Deviation	.79
My manager has actively contributed to providing me with a better understanding of OE	Mean	1.93
	N	201
	Std. Deviation	1.03
I believe that the company is committed to encouraging OE engagement on all levels within the company	Mean	1.44
	N	200
	Std. Deviation	.75
I believe that my co-workers are interested in participating in OE-type activities	Mean	2.15
	N	202
	Std. Deviation	1.04
I think that the current management structure in which I work is fully committed to OE	Mean	1.70
	N	202
	Std. Deviation	.98
I am aware of opportunities to participate in OE	Mean	2.18
	N	200
	Std. Deviation	1.18
My current manager is very knowledgeable about OE	Mean	1.77
	N	199
	Std. Deviation	.98
My current manager has expressed his desire to increase OE participation among our team	Mean	2.08
	N	201
	Std. Deviation	1.08
I have participated in an OE-related training or workshop in the last year	Mean	2.33
	N	202
	Std. Deviation	1.49

1=Strongly agree
2=Slightly agree
3=Neither agree not disagree
4=Slightly disagree
5=Strongly disagree
6=Not applicable

Appendix G: Bivariate Correlations

Dependent Variables	Statistics	My role within the company	Business Unit	Geographic Location	Primary Work Environment	Years with the company	Highest level of educational attainment	If college graduate, did I study construction management and/or engineering?	My current organizational structure	Have I attended any type of seminar and/or courses in Operational Excellence (OE)
I do not understand how OE relates to my current role in the company	Pearson Correlation	-.01	-.03	.06	.10	-.05	-.11	.01	.02	-.17*
	Sig. (2-tailed)	.85	.72	.39	.17	.44	.12	.91	.80	.02
	N	204	204	204	204	204	204	204	204	204
I think that OE requirements get in the way of the work that needs to be done	Pearson Correlation	-.01	.07	-.04	.03	-.12	-.01	.03	.03	-.10
	Sig. (2-tailed)	.93	.29	.60	.70	.10	.86	.70	.73	.17
	N	202	202	202	202	202	202	202	202	202
I cannot name any of the key OE focus areas	Pearson Correlation	.05	.05	.10	.06	.11	-.01	-.02	.06	-.21**
	Sig. (2-tailed)	.51	.48	.17	.36	.13	.94	.80	.37	.00
	N	202	202	202	202	202	202	202	202	202
The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	Pearson Correlation	.06	.04	-.15*	.01	-.20**	.03	.02	.08	-.12
	Sig. (2-tailed)	.39	.54	.04	.91	.00	.71	.75	.24	.09
	N	203	203	203	203	203	203	203	203	203
I do not understand the purpose of our firm's corporate OE vision	Pearson Correlation	-.01	-.00	.03	-.02	-.09	.08	-.04	.05	-.09
	Sig. (2-tailed)	.93	1.00	.65	.84	.23	.25	.55	.49	.20
	N	202	202	202	202	202	202	202	202	202
I don't think that my manager demonstrates the OE culture	Pearson Correlation	-.00	.13	-.02	-.03	-.10	.09	-.09	.05	-.04
	Sig. (2-tailed)	.98	.06	.77	.63	.17	.19	.20	.48	.61
	N	203	203	203	203	203	203	203	203	203
The understanding of OE is not consistent among the workforce	Pearson Correlation	-.14*	.09	.02	-.11	-.19**	.09	-.12	.09	.01
	Sig. (2-tailed)	.04	.21	.79	.12	.01	.19	.09	.22	.88
	N	202	202	202	202	202	202	202	202	202
I don't think that my current staff (direct reports) actively	Pearson Correlation	-.365**	-.012	.02	-.11	-.03	.16*	-.14	.10	.06
	Sig. (2-tailed)	.000	.870	.79	.12	.67	.03	.06	.18	.44

participate in OE	N	201	201	201	201	201	201	201	201	201
The purpose of OE has never been fully explained to me	Pearson Correlation	.04	.08	-.02	-.04	.01	.06	-.08	.05	-.23**
	Sig. (2-tailed)	.60	.27	.84	.59	.86	.39	.28	.49	.00
	N	200	200	200	200	200	200	200	200	200
My work group's current organizational structure does not lend itself to effective OE implementation	Pearson Correlation	-.10	-.03	-.04	-.02	.01	.04	-.07	-.01	-.08
	Sig. (2-tailed)	.17	.66	.62	.81	.92	.59	.34	.93	.24
	N	201	201	201	201	201	201	201	201	201
For the type of work that I perform, engagement with OE is meaningless	Pearson Correlation	.05	.05	.09	.11	-.08	.05	-.19**	.04	-.09
	Sig. (2-tailed)	.48	.50	.22	.13	.26	.49	.01	.54	.20
	N	203	203	203	203	203	203	203	203	203
Training courses and meetings in OE expectations and execution are not of any benefit to me	Pearson Correlation	.02	.10	.07	.11	-.08	-.02	-.04	.14	-.02
	Sig. (2-tailed)	.75	.16	.36	.13	.29	.79	.57	.06	.75
	N	197	197	197	197	197	197	197	197	197
Training courses and meetings in OE expectations and execution are not of any interest to me	Pearson Correlation	-.00	.06	.07	.16*	-.12	-.09	-.05	.07	-.11
	Sig. (2-tailed)	.98	.38	.32	.02	.08	.21	.45	.34	.12
	N	203	203	203	203	203	203	203	203	203
My current manager does not actively emphasize OE expectations among the team	Pearson Correlation	.05	.19**	-.04	.03	-.01	-.01	.04	.05	-.03
	Sig. (2-tailed)	.47	.01	.53	.66	.84	.92	.57	.49	.71
	N	203	203	203	203	203	203	203	203	203
I think that the company is spending too much time and money on OE	Pearson Correlation	-.06	.12	-.06	.08	-.20**	-.02	.00	.11	-.09
	Sig. (2-tailed)	.43	.09	.39	.25	.01	.79	.96	.11	.20
	N	203	203	203	203	203	203	203	203	203
Safety and efficiency are two of the five key components of OE. I can name the other three.	Pearson Correlation	-.10	-.20**	.09	-.01	-.11	.07	-.09	-.25**	.25**
	Sig. (2-tailed)	.15	.01	.21	.92	.14	.35	.21	.00	.00
	N	200	200	200	200	200	200	200	200	200
I understand the Tenets of Operation	Pearson Correlation	-.07	-.09	-.02	-.14*	-.10	.07	.05	-.05	.07
	Sig. (2-tailed)	.33	.20	.80	.05	.14	.36	.46	.46	.30
	N	202	202	202	202	202	202	202	202	202
I believe that my co-workers understand the Tenets of	Pearson Correlation	-.03	-.04	-.09	.05	.03	-.07	.04	.03	-.08
	Sig. (2-tailed)	.70	.57	.21	.50	.73	.31	.55	.63	.24

Operation	N	198	198	198	198	198	198	198	198	198
I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	Pearson Correlation	-.10	-.15*	.11	-.01	.01	.04	.04	-.02	.13
	Sig. (2-tailed)	.15	.03	.14	.86	.88	.55	.62	.78	.08
	N	202	202	202	202	202	202	202	202	202
I would like to participate in training and/or courses to develop a better understanding of OE	Pearson Correlation	-.11	-.05	-.03	-.12	.06	.09	-.03	-.11	.10
	Sig. (2-tailed)	.12	.45	.70	.09	.39	.18	.72	.12	.15
	N	202	202	202	202	202	202	202	202	202
I understand the firm's corporate vision for Operational Excellence	Pearson Correlation	-.06	-.08	.01	-.02	.13	-.05	.07	-.05	.13
	Sig. (2-tailed)	.37	.29	.85	.77	.07	.48	.30	.49	.07
	N	201	201	201	201	201	201	201	201	201
I understand the OE responsibilities that are specific to my role within the company	Pearson Correlation	-.09	-.15*	.04	-.11	-.14	.06	-.06	-.03	.23**
	Sig. (2-tailed)	.21	.04	.58	.13	.05	.40	.38	.71	.00
	N	200	200	200	200	200	200	200	200	200
My manager has actively contributed to providing me with a better understanding of OE	Pearson Correlation	.04	-.11	.03	.05	.06	.01	-.01	-.10	.19**
	Sig. (2-tailed)	.61	.11	.66	.53	.42	.93	.95	.14	.01
	N	201	201	201	201	201	201	201	201	201
I believe that the company is committed to encouraging OE engagement on all levels within the company	Pearson Correlation	.01	-.10	.02	.02	.03	-.10	.20**	-.09	.03
	Sig. (2-tailed)	.92	.15	.79	.82	.65	.18	.00	.20	.71
	N	200	200	200	200	200	200	200	200	200
I believe that my co-workers are interested in participating in OE-type activities	Pearson Correlation	-.06	-.03	.02	-.04	.16*	-.04	.13	-.01	.11
	Sig. (2-tailed)	.44	.67	.78	.60	.02	.61	.07	.93	.13
	N	202	202	202	202	202	202	202	202	202
I think that the current management structure in which I work is fully committed to OE	Pearson Correlation	-.04	-.12	.11	-.01	.09	-.03	.13	.02	.12
	Sig. (2-tailed)	.56	.08	.14	.84	.21	.63	.07	.75	.10
	N	202	202	202	202	202	202	202	202	202
I am aware of opportunities to participate in OE	Pearson Correlation	-.08	-.16*	.09	.07	.03	.00	.01	-.11	.31**
	Sig. (2-tailed)	.29	.03	.23	.36	.69	.99	.92	.11	.00
	N	200	200	200	200	200	200	200	200	200

My current manager is very knowledgeable about OE	Pearson Correlation	-.09	-.19**	.05	.00	-.01	.07	-.02	-.02	.15*
	Sig. (2-tailed)	.22	.01	.46	.96	.90	.34	.77	.74	.04
	N	199	199	199	199	199	199	199	199	199
My current manager has expressed his desire to increase OE participation among our team	Pearson Correlation	-.07	-.11	.03	.02	-.04	.02	.01	-.17*	.16*
	Sig. (2-tailed)	.35	.12	.70	.82	.56	.81	.91	.02	.02
	N	201	201	201	201	201	201	201	201	201
I have participated in an OE-related training or workshop in the last year	Pearson Correlation	-.08	-.17*	.11	.02	-.02	-.00	-.05	-.12	.35**
	Sig. (2-tailed)	.27	.02	.13	.79	.78	.96	.49	.10	.00
	N	202	202	202	202	202	202	202	202	202

NOTE: *Correlation is significant at the 0.05 level
NOTE: **Correlation is significant at the 0.01 level (2-tailed).

Appendix H: Statistically Significant Linear Regression Models ($p \leq .05$)

Independent Variable	Dependent Variable	Beta	R^2	Estimated coefficient	t	Sig.
My role within the company	The understanding of OE is not consistent among the workforce	-.14	.02	-.22	-2.06	.04
	I don't think that my current staff (direct reports) actively participate in OE	-.37	.13	-.47	-5.53	.00
Business Unit	My current manager does not actively emphasize OE expectations among the team	.19	.04	.15	2.68	.01
	Safety and efficiency are two of the five key components of OE. I can name the other three	.20	.04	-.24	-2.82	.01
	I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	.15	.02	-.12	-2.15	.03
	I understand the OE responsibilities that are specific to my role within the company	.15	.02	-.10	-2.10	.04
	I am aware of opportunities to participate in OE	.16	.02	-.16	-2.21	.03
	My current manager is very knowledgeable about OE	.19	.04	-.17	-2.77	.01
	I have participated in an OE-related training or workshop in the past year	.17	.03	-.22	-2.46	.02
Geographic Location	The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	.15	.02	-.13	-2.13	.04
Primary Work Environment	Training courses and meetings in OE expectations and execution are not of any interest to me	.16	.03	.37	2.36	.02
	I understand the Tenets of Operation	.14	.02	-.32	-1.99	.05
Years with the Company	The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	.20	.04	-.22	-2.94	.00
	The understanding of OE is not consistent among the workforce	.19	.03	-.26	-2.66	.01

	I think that the company is spending too much time and money on OE	.20	.04	-.20	-2.81	.01
Highest level of educational attainment	I don't think that my current staff (direct reports) actively participate in OE	.16	.02	.18	2.22	.03
If college graduate, did I study construction management and/or engineering?	For the type of work that I perform, engagement with OE is meaningless	.19	.04	-.19	-2.72	.01
	I believe that the company is committed to encouraging OE engagement on all levels within the company	.20	.04	.21	2.94	.00
My current organizational structure	Safety and efficiency are two of the five key components of OE. I can name the other three	.25	.06	-.42	-3.64	.00
	My current manager has expressed his desire to increase OE participation among our team	.17	.03	-.22	-2.42	.02
Have I attended any type of seminar and/or courses in Operational Excellence (OE)?	I do not understand how OE relates to my current role in the company	.17	.03	-.30	-2.46	.02
	I cannot name any of the key OE focus areas	.21	.04	-.31	-3.05	.00
	The purpose of OE has never been fully explained to me	.23	.05	-.31	-3.35	.00
	Safety and efficiency are two of the five key components of OE. I can name the other three	.25	.06	.47	3.55	.00
	I understand the OE responsibilities that are specific to my role within the company	.23	.05	.25	3.24	.00
	My manager has actively contributed to providing me with a better understanding of OE	.19	.04	.27	2.73	.01
	I am aware of opportunities to participate in OE	.31	.10	.51	4.55	.00
	My current manager is very knowledgeable about OE	.15	.02	.20	2.12	.04
	My current manager has expressed his desire to increase OE participation among our team	.16	.03	.24	2.30	.02
	I have participated in an OE-related training or workshop in the past year	.35	.12	.72	5.24	.00

Appendix I: One-Way ANOVA for Independent Variables ($p \leq .05$)

Independent Variable	Dependent Variable	Mean²	F	Sig.
My role within the company	The understanding of OE is not consistent among the workforce	6.55	3.78	.01
	I don't think that my current staff (direct reports) actively participate in OE	13.67	11.83	.00
	I think that the company is spending too much time and money on OE	4.67	4.89	.00
	My manager has actively contributed to providing me with a better understanding of OE	3.24	3.16	.03
Business Unit	The understanding of OE is not consistent among the workforce	5.95	3.38	.04
	My current manager does not actively emphasize OE expectations among the team	2.77	3.58	.03
	Safety and efficiency are two of the five key components of OE. I can name the other three	11.96	6.59	.00
	I understand the OE responsibilities that are specific to my role within the company	2.57	4.26	.02
	My current manager is very knowledgeable about OE	4.68	5.05	.01
	I have participated in an OE-related training or workshop in the past year	9.89	4.59	.01
Geographic Location	I believe that my co-workers understand the Tenets of Operation	2.25	2.43	.05
	I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	1.88	2.53	.04
Primary Work Environment	Training courses and meetings in OE expectations and execution are not of any interest to me	3.96	5.57	.02
	I understand the Tenets of Operation	2.74	3.94	.05

Years with the Company	The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	3.79	3.60	.02
	The understanding of OE is not consistent among the workforce	5.60	3.21	.02
	I don't think that my current staff (direct reports) actively participate in OE	3.58	2.73	.05
	For the type of work that I perform, engagement with OE is meaningless	2.14	4.02	.01
	Training courses and meetings in OE expectations and execution are not of any interest to me	1.92	2.71	.05
	I think that the company is spending too much time and money on OE	3.34	3.43	.02
Highest level of educational attainment	I do not understand the purpose of our firm's corporate OE vision	1.86	2.78	.03
	I don’t think that my manager demonstrates the OE culture	2.48	2.88	.02
	For the type of work that I perform, engagement with OE is meaningless	1.96	3.72	.01
	Training courses and meetings in OE expectations and execution are not of any interest to me	1.79	2.53	.04
	My current manager is very knowledgeable about OE	2.92	3.16	.02
If college graduate, did I study construction management and/or engineering?	For the type of work that I perform, engagement with OE is meaningless	3.01	5.66	.00
	I believe that the company is committed to encouraging OE engagement on all levels within the company	2.57	4.68	.01
My current organizational structure	I think that OE requirements get in the way of the work that needs to be done	4.38	4.28	.02
	The corporation's leaders need to focus their attention on much more important issues than on developing OE expertise	3.36	3.13	.05
	I don’t think that my manager demonstrates the OE culture	5.17	6.08	.00
	The purpose of OE has never been fully explained to me	2.90	3.20	.04

	For the type of work that I perform, engagement with OE is meaningless	2.01	3.71	.03
	Training courses and meetings in OE expectations and execution are not of any interest to me	3.03	4.31	.02
	My current manager does not actively emphasize OE expectations among the team	4.29	5.65	.00
	I think that the company is spending too much time and money on OE	7.31	7.72	.00
	Safety and efficiency are two of the five key components of OE. I can name the other three	12.62	6.98	.00
	I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	4.93	6.79	.00
	I would like to participate in training and/or courses to develop a better understanding of OE	10.03	9.65	.00
	My current manager has expressed his desire to increase OE participation among our team	5.17	4.63	.01
Have I attended any type of seminar and/or courses in Operational Excellence (OE)?	I do not understand how OE relates to my current role in the company	6.04	3.72	.03
	I cannot name any of the key OE focus areas	9.17	8.83	.00
	The purpose of OE has never been fully explained to me	6.91	7.99	.00
	For the type of work that I perform, engagement with OE is meaningless	1.97	3.63	.03
	Safety and efficiency are two of the five key components of OE. I can name the other three	18.85	10.81	.00
	I understand the Tenets of Operation	2.12	3.06	.05
	I understand the OE responsibilities that are specific to my role within the company	4.81	8.29	.00
	My manager has actively contributed to providing me with a better understanding of OE	5.05	4.96	.01
	I am aware of opportunities to participate in OE	23.00	19.80	.00
	My current manager is very knowledgeable about OE	3.60	3.85	.02

My current manager has expressed his desire to increase OE participation among our team	10.02	9.38	.00
I have participated in an OE-related training or workshop in the past year	60.02	36.34	.00

Appendix J: Regressions by Construct: OE Comprehension

Model	Dependent Variable	R value[a]	R Square	Adjusted R Square	Std. Error of the Estimate
1	I do not understand how OE relates to my current role in the company	.26	.07	.02	1.28
2	I cannot name any of the key OE focus areas	.28	.08	.03	1.04
3	I do not understand the purpose of our firm's corporate OE vision	.17	.03	-.02	.84
4	The understanding of OE is not consistent among the workforce	.30	.09	.05	1.31
5	The purpose of OE has never been fully explained to me	.26	.07	.02	.95
6	Safety and efficiency are two of the five key OE components. I can name the other three.	.40	.16	.12	1.30
7	I understand the Tenets of Operation	.25	.06	.02	.83
8	I believe that my co-workers understand the Tenets of Operation	.17	.03	-.02	9.86
9	I understand the firm's corporate vision for Operational Excellence	.23	.05	.01	.81
10	I understand the OE responsibilities that are specific to my role within the company	.32	.10	.06	.77

Regressions by Construct: OE Comprehension (Averages)

Model	Dependent Variable	R value[a]	R Square	Adjusted R Square	Std. Error of the Estimate
Averages:		.26	.07	.03	1.90

ANOVA by Construct: OE Comprehension

Model	Dependent Variable		Sum of Squares	df	Mean Square	F	Sig.
1	I do not understand how OE relates to my current role in the company	Regression	22.88	9	2.54	1.56	.13
		Residual	316.00	194	1.63		
		Total	338.88	203			
2	I cannot name any of the key OE focus areas	Regression	17.19	9	1.91	1.77	.08
		Residual	207.70	192	1.08		
		Total	224.89	201			
3	I do not understand the purpose of our firm's corporate OE vision	Regression	4.01	9	.45	.63	.77
		Residual	134.88	192	.70		
		Total	138.89	201			
4	The understanding of OE is not consistent among the workforce	Regression	33.19	9	3.69	2.15	.03
		Residual	329.41	192	1.72		
		Total	362.59	201			
5	The purpose of OE has never been fully explained to me	Regression	12.47	9	1.39	1.53	.14
		Residual	171.53	190	.90		
		Total	184.00	199			
6	Safety and efficiency are two of the five key OE components. I can name the other three.	Regression	62.03	9	6.89	4.10	.00
		Residual	319.33	190	1.68		
		Total	381.36	199			
7	I understand the Tenets of Operation	Regression	8.54	9	.95	1.37	.21
		Residual	133.36	192	.70		
		Total	141.90	201			
8	I believe that my co-workers understand the Tenets of Operation	Regression	5.30	9	.59	.61	.79
		Residual	182.62	188	.97		
		Total	187.92	197			
9	I understand the firm's corporate vision for Operational Excellence	Regression	6.94	9	.77	1.18	.31
		Residual	125.21	191	.66		
		Total	132.15	200			
10	I understand the OE responsibilities that are specific to my role within the company	Regression	12.28	9	1.37	2.32	.02
		Residual	111.71	190	.59		
		Total	124.00	199			

ANOVA by Construct: OE Comprehension (Averages)

		Sum of Squares	df	Mean Square	F	Sig.
Averages:	Regression	18.48	9	2.05	1.72	.25
	Residual	203.18	191	1.06		
	Total	221.66	200			

Appendix K: Regressions by Construct: OE Engagement

Model	Dependent Variable	R value[a]	R Square	Adjusted R Square	Std. Error of the Estimate
1	I think that OE requirements "get in the way" of the work that needs to be done	.17	.03	-.02	1.04
2	The company's leaders need to focus their attention on much more important issues than on developing OE expertise	.28	.08	.03	1.03
3	For the type of work that I perform, engagement with OE is meaningless	.31	.10	.05	.73
4	Training course and meetings in OE expectations and execution would not be of any benefit to me	.26	.07	.02	.80
5	Training courses and meetings in OE expectations and execution are not of any interest to me	.31	.10	.06	.83
6	I would like to participate in training and/or courses to develop a better understanding of OE	.26	.07	.03	1.05
7	I believe that the firm is committed to encouraging OE engagement on all levels within the company	.26	.07	.02	.75
8	I believe that my co-workers are interested in participating in OE-type activities	.26	.07	.03	1.02
9	I am aware of opportunities to participate in OE	.35	.13	.08	1.13
10	I have participated in an OE-related training or workshop in the past year	.38	.15	.11	1.41

Regressions by Construct: OE Engagement (Averages)

Model	Dependent Variable	R value[a]	R Square	Adjusted R Square	Std. Error of the Estimate
Averages:		.29	.09	.04	.98

ANOVA by Construct: OE Engagement

Model	Dependent Variable		Sum of Squares	df	Mean Square	F	Sig.
1	I think that OE requirements "get in the way" of the work that needs to be done	Regression	6.20	9	.69	.64	.76
		Residual	206.12	192	1.07		
		Total	212.32	201			
2	The company's leaders need to focus their attention on much more important issues than on developing OE expertise	Regression	16.95	9	1.88	1.78	.07
		Residual	203.94	193	1.06		
		Total	220.89	202			
3	For the type of work that I perform, engagement with OE is meaningless	Regression	10.79	9	1.20	2.28	.02
		Residual	101.48	193	.53		
		Total	112.27	202			
4	Training course and meetings in OE expectations and execution would not be of any benefit to me	Regression	8.81	9	.98	1.52	.14
		Residual	120.41	187	.64		
		Total	129.22	196			
5	Training courses and meetings in OE expectations and execution are not of any interest to me	Regression	14.45	9	1.61	2.34	.02
		Residual	132.27	193	.69		
		Total	146.72	202			
6	I would like to participate in training and/or courses to develop a better understanding of OE	Regression	15.85	9	1.76	1.60	.12
		Residual	210.88	192	1.10		
		Total	226.73	201			
7	I believe that the firm is committed to encouraging OE engagement on all levels within the company	Regression	7.77	9	.86	1.56	.13
		Residual	105.51	190	.56		
		Total	113.28	199			
8	I believe that my co-workers are interested in participating in OE-type activities	Regression	14.97	9	1.66	1.59	.12
		Residual	200.58	192	1.05		
		Total	215.55	201			
9	I am aware of opportunities to participate in OE	Regression	34.29	9	3.81	3.01	.00
		Residual	240.58	190	1.27		
		Total	274.88	199			
10	I have participated in an OE-related training or workshop in the past year	Regression	66.32	9	7.37	3.70	.00
		Residual	382.46	192	1.99		
		Total	448.78	201			

ANOVA by Construct: OE Engagement (Averages)

		Sum of Squares	df	Mean Square	F	Sig.
Averages:	Regression	19.64	9	2.18	2.00	.14
	Residual	190.42	191	.99		
	Total	210.06	200			

Appendix L: Regressions by Construct: Leadership Awareness

Model	Dependent Variable	R value[a]	R Square	Adjusted R Square	Std. Error of the Estimate
1	I don't think that my manager demonstrates the OE culture	.20	.04	-.01	.95
2	I don't think that my current staff (direct reports) actively participate in OE	.44	.19	.15	1.07
3	My work group's current organizational structure does not lend itself to effective OE implementation	.16	.03	-.02	.96
4	My current manager does not actively emphasize OE expectations among the team	.20	.04	-.00	.89
5	I think that the firm is spending too much time and money on OE	.26	.07	.02	.95
6	I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	.24	.06	.01	.87
7	My manager has actively contributed to providing me with a better understanding of OE	.24	.06	.02	1.02
8	I think that the current management structure in which I work is fully committed to OE	.25	.06	.02	.98
9	My current manager is very knowledgeable about OE	.26	.07	.02	.97
10	My current manager has expressed his/her desire to increase OE participation among our team	.25	.06	.02	1.07

Regressions by Construct: Leadership Awareness (Averages)

Model	Dependent Variable	R value[a]	R Square	Adjusted R Square	Std. Error of the Estimate
Averages:		.25	.07	.02	.97

ANOVA by Construct: Leadership Awareness

Model	Dependent Variable		Sum of Squares	df	Mean Square	F	Sig.
1	I don't think that my manager demonstrates the OE culture	Regression	6.88	9	.77	.85	.57
		Residual	173.51	193	.90		
		Total	180.40	202			
2	I don't think that my current staff (direct reports) actively participate in OE	Regression	51.56	9	5.73	5.04	.00
		Residual	217.04	191	1.14		
		Total	268.60	200			
3	My work group's current organizational structure does not lend itself to effective OE implementation	Regression	4.74	9	.53	.57	.82
		Residual	177.41	191	.93		
		Total	182.15	200			
4	My current manager does not actively emphasize OE expectations among the team	Regression	33.19	9	3.69	2.15	.03
		Residual	329.41	192	1.72		
		Total	362.59	201			
5	I think that the firm is spending too much time and money on OE	Regression	6.51	9	.72	.91	.52
		Residual	154.09	193	.80		
		Total	160.60	202			
6	I believe that my manager is committed to developing direct reports who can work successfully within the OE expectations	Regression	8.84	9	.98	1.29	.24
		Residual	145.65	192	.76		
		Total	154.48	201			
7	My manager has actively contributed to providing me with a better understanding of OE	Regression	12.52	9	1.39	1.33	.22
		Residual	199.36	191	1.04		
		Total	211.88	200			
8	I think that the current management structure in which I work is fully committed to OE	Regression	11.97	9	1.33	1.40	.19
		Residual	182.61	192	.95		
		Total	194.58	201			
9	My current manager is very knowledgeable about OE	Regression	12.96	9	1.44	1.53	.14
		Residual	177.87	189	.94		
		Total	190.82	198			
10	My current manager has expressed his/her desire to increase OE participation among our team	Regression	14.43	9	1.60	1.41	.19
		Residual	217.13	191	1.14		
		Total	231.56	200			

ANOVA by Construct: Leadership Awareness (Averages)

Model	Dependent Variable		Sum of Squares	df	Mean Square	F	Sig.
Averages:		Regression	16.36	9	1.82	1.65	.29
		Residual	197.41	192	1.03		
		Total	213.77	201			

IRB Clearance

University of San Diego

ENTERED 3/16/15

Institutional Review Board
Project Action Summary

Action Date: March 12, 2015 *Note: Approval expires one year after this date.*

Type: __New Full Review ___New Expedited Review _X__Continuation Review ___Exempt Review ____Modification

Action: _X__Approved ___Approved Pending Modification ___Not Approved

Project Number: 2014-03-197
Researcher(s): Ruben Roberto Fontes Doc SOLES
Dr. George Reed Fac SOLES
Project Title: Implementation of Operational Excellence: Challenges Related to Employee Perception and Organizational Culture

Note: We send IRB correspondence regarding student research to the faculty advisor, who bears the ultimate responsibility for the conduct of the research. We request that the faculty advisor share this correspondence with the student researcher.

Modifications Required or Reasons for Non-Approval

None

The next deadline for submitting project proposals to the Provost's Office for full review is N/A. You may submit a project proposal for expedited review at any time.

Dr. Thomas R. Herrinton
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